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THE IRON AGE

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... THE IRON AGE ...

JULY 20, 1939

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Vol. 144, No. 3

No Reserved Seats

THIS strike of certain members of the WPA fraternity against the Government's program of relief for the unemployed reminds me of a story.

Once upon a time there was an extremely charitable family, and one fairly well-to-do, that lived on the outskirts of a certain town.

The heads of this family, Samuel Jones and his wife Samantha Jones, familiarly known as Uncle Sam and Aunt Samantha, had experienced the vicissitudes of life and therefore were sympathetic with the handicapped and the unfortunate. Uncle Sam had had to make his way by dint of strenuous labor against great odds, and his wife, Samantha, had had to count and to conserve every penny to make ends meet. However, by exercising the virtues of frugality, they had arrived at a comfortable competence.

In spite of their comparatively affluent circumstances, this couple could never forget its humble beginnings. Nor could they forget or lose sympathy with the less fortunate. So they resolved that as long as they were in position to do so, no application for help from people in distress should go unheeded.

As a result of this determination, their home became the mecca of the unfortunate "tourists" who needed a meal or a night's lodging. No one was turned away. With Uncle Samuel and Aunt Samantha, "to ask, was to receive." But with one qualification.

That qualification was this. Uncle Sam firmly believed that what the unfortunate needed was not charity, so much as the opportunity to earn a living. Free meals, therefore, were taboo. All comers were welcome to sit down to a hearty meal or to enjoy a night's lodging, provided they were willing to chop a certain amount of wood.

This system worked very well, until one day along came a sojourner who requested a meal. Aunt Samantha started to explain to him the conditions set down by Uncle Samuel for earning a meal ticket. But the applicant interrupted her—"Isn't that chap sitting at the table a common laborer?"

"Yes," answered Aunt Samantha.

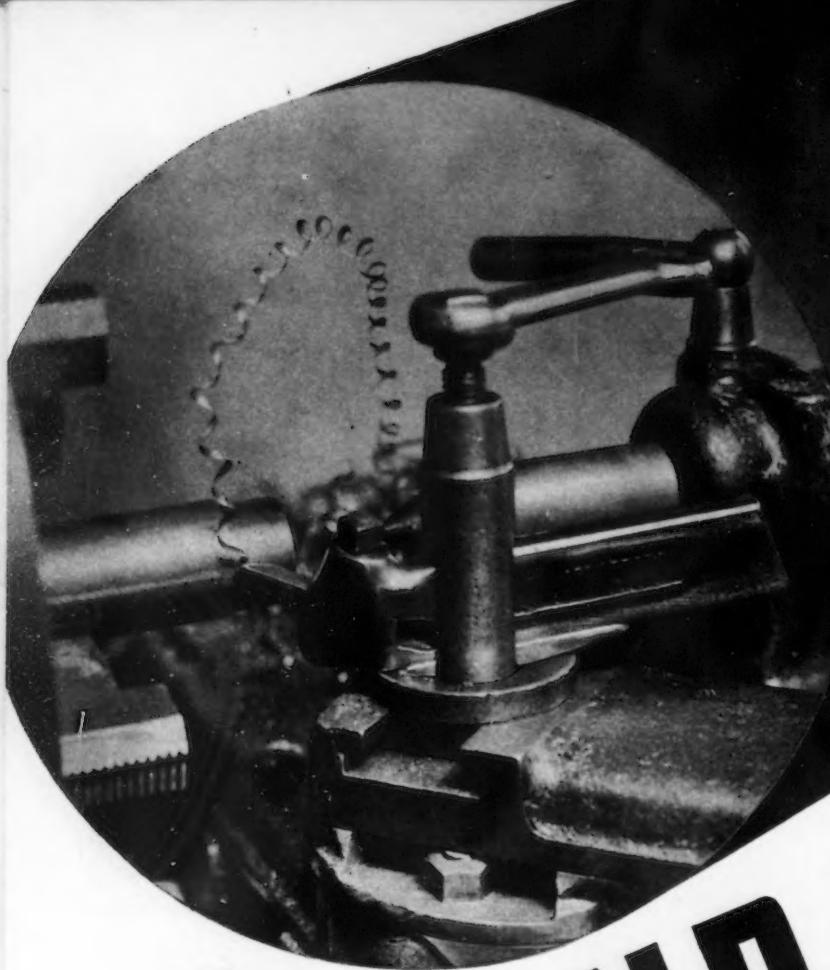
"How much wood did he have to chop?" inquired her questioner.

"If it's any of your business," answered Aunt Samantha, "it was 16 sticks."

"In that case," remarked the newcomer, "I should get my dinner for chopping not more than four, since when employed I earned four times as much per hour as that laborer."

What Aunt Samantha said to this chap can easily be imagined. And the moral of this story is that there are no reserved seats on a life raft, except for women and children.

J. A. Vaudreuil



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SHEETS STRIP TIN PLATE BARS PLATES FLOOR PLATES STRUCTURALS PILING RAILS TRACK ACCESSORIES REINFORCING BARS

DECARBURIZATION OF STEEL

BY M. H. MAWHINNEY
SALEM, OHIO

In this, the first section of a two-part article, the author describes the effect of atmosphere, temperature and type of steel on oxidation, and all factors determining decarburization of steel in open furnaces. Next week, specific data will be given on decarburization in various types of steel heating furnaces.

• • •

ONE of the most important problems in modern steel making is the decarburization of steel when heated for the various steps in its manufacture. The decarburization of steel may be simply defined as the loss of carbon from the surface as the result of reaction with the hot gases surrounding the steel during heating or cooling. But from that point the question is anything but simple. The large number of complicating factors which affect the carbon loss have so far prevented the compilation of sufficient complete data for a comprehensive study of the subject. The development of positive control of the difficulty is yet in the stage where available information is scattered and confusing, much as is the situation in some branches of medical research. The purpose of this article is to contribute a small amount of additional evidence on this subject to an outline of the more important heating processes of the steel industry, particularly as a guide to the form in which additional data can be added in order to

make it comparative and consequently more useful.

Laboratory research has established the fact that certain gases are definitely decarburizing to steel; that others are carburizing in their action; and that others are practically neutral to steel at elevated temperatures. Progress has also been made in determining the stability of various gas combinations in contact with heated steel of various analyses, but much work remains to be done in this field.

With some definite information available, the next step is the practical application, and it is in this phase that the writer is primarily interested. Until recently all furnaces were open-fired and the factor of scale (oxidation of the iron content) could be counted upon to assist in the reduction of decarburization to limits allowable at that time, by actually removing the decarburized surface in the form of iron oxide, or scale. Now there are an important number of clean, or bright-heating furnaces utilizing a protective atmosphere to prevent ox-

idation of the iron. This has been developed with comparative ease, but the difficulty has been an increased residual decarburization of many steels, and this, together with more rigid specifications, has constituted a new major problem for the makers and users of steel.

In discussing the problem the logical plan is to consider the open furnace and the protective atmosphere furnace separately, and this method will be adhered to in the following discussion.

Open-Fired Furnaces

Open furnaces are those in which the flue gases resulting from the combustion of the fuel are in direct contact with the steel during heating and cooling. For the entire range of fuels, these flue gases consist of varying percentages of carbon dioxide, water vapor, and nitrogen when the theoretical amount of combustion air is supplied and perfectly mixed with the fuel. Practically, the atmosphere also includes either oxygen from an excessive supply of air, or carbon monoxide and hydrogen resulting from a deficiency of air, or all of them resulting from poor mixing of air and fuel. The first atmosphere from an excess of air is known as "lean" or oxidizing which is correct, while the atmosphere from a deficiency of air is commonly called "rich" or reducing, which is not correct because in contact with steel the usual reducing atmosphere will dissoci-

iate to release oxygen and oxidize the steel.

An investigation by W. E. Jominy and D. W. Murphy has established the relation between the atmosphere in open furnaces and the oxidation or scaling of steel. Using city gas at furnace temperatures of about 2000 deg. F., they have shown that up to 6 per cent CO (about 77 per cent of theoretical combustion air) the reduction of scale formed was not noticeable. From that point to 12 per cent CO in the flue gases (63 per cent complete combustion) there is a gradual reduction in scale formation, and from there to 16.5 per cent CO (55 per cent theoretical air) the scale formation drops rapidly to practically zero. For practical purposes then, scale cannot be controlled to any extent, because beyond 6 per cent CO (7.7 to 1 air-gas ratio for natural gas) temperature cannot be satisfactorily maintained in an open furnace.

The same investigation by Jominy and Murphy has also contributed information on the effect of temperature and steel analysis upon oxidation, which is of value in a study of decarburization. Their tests have shown that for SAE 1015 steel heated in the usual "neutral" atmosphere of a city gas fired furnace, the loss of weight per 100 sq. in. of exposed steel is about as follows: At 2000 deg. F. the loss is 0.09 lb. per 100 sq. in. of exposed area; at 2100 deg., it is 0.13 lb.; at 2200 deg., it is 0.18 lb.; at 2300 deg., it is 0.23 lb.; and at 2400 deg., the loss is 0.32 lb. per 100 sq. in. of exposed area.

For the same neutral atmosphere (negligible CO or H₂ in the flue gases) and a common temperature of 2300 deg. F., the relative scaling rate for several standard steels, as indicated by the loss in lb. per 100 sq. in. is as follows: For SAE 1030 steel, the loss is 0.32 lb. per 100 sq. in. of exposed area; for SAE 1050 steel, the loss is 0.29 lb.; for SAE 1015 steel, the loss is 0.24 lb.; for SAE 1090 steel, the loss is 0.19 lb.; for high speed steel, the loss is 0.38 lb.; for SAE 4140 steel, the loss is 0.27 lb.; for SAE 6145 steel, the loss is 0.26 lb.; for SAE 3130 steel, the loss is 0.19 lb.; for SAE 2320 steel, the loss is 0.19 lb.; and for SAE 4615 steel, the loss is 0.18 lb. per 100 sq. in. of exposed surface.

The various factors which affect the formation of scale in an open furnace include:

The fuel used, which determines the chemical analysis of the furnace atmosphere, particularly the relative amounts of active oxidizing components (oxygen, CO₂, and water vapor).

TABLE I
Decarburization in Soaking Pits

FACTORS (see text)	Regenerative Pit, Natural Draft				Regenerative Pit, Forced Draft			
	Producer gas				Producer gas			
(1) Fuel	0.01 in. water negative				0.05 in. water positive			
(2) Furnace pressure	2150 to 2335 deg. F.				2150 to 2350 deg. F.			
(3) Temperature	oxidizing				slightly oxidizing			
(4) Air-gas ratio	none				none			
(5) Type burner								
(6) Per cent area increase	308	380	550	550	308	380	550	550
(7) Time in pit, hours	6.9	9.8	7.7	6.1	6.5	9.8	7.7	5.6
(8) Grade steel, SAE	1010	2335	9260	1065	1010	2335	9260	1065
DECARBURIZATION, IN INCHES								
Carbonless	0.000	0.000	0.000	0.011	0.002	0.000	0.000	0.002
Pronounced	0.010	0.017	0.027	0.007	0.008	0.010	0.006	0.003
Slight	0.010	0.013	0.014	0.007	0.010	0.010	0.010	0.005
Actual total depth	0.020	0.030	0.041	0.025	0.020	0.020	0.016	0.010
Total depth corrected to 300 per cent area increase	0.021	0.038	0.075	0.046	0.021	0.025	0.029	0.018
REMARKS								
Ingot size, in inches	23	23	22	22	23	23	22	22
Billet size, in inches	8x7	6x6	4x4	4x4	8x7	6x6	4x4	4x4
All cherry or red ingots when charged.								

Furnace pressure, which determines whether or not free air is drawn into the furnace and in what quantity.

Temperature of the steel as previously discussed.

Air-gas ratio, which affects the analysis of the atmosphere.

Type of burner, because the degree of mixing affects the atmosphere produced, and because the different burner block temperatures with various burners affect the extent of dissociation. Variation and tightness of scale with different burners are recognized but no correlated data are available.

Time at temperature.

Analysis of the steel.

These factors are common to all open fired furnaces and constant efforts are made to control at least some of them in all heating processes. Individual solutions are of necessity arrived at, but any extensive collection of information is still in an early stage of development. In addition to these common factors, there are others to be found in special cases, including the use of covers and protective compounds.

The amount of oxidizing gas which comes in contact with the steel in unit of time is obviously important in the results obtained, but cannot be controlled in most cases, since it is a function of the heat required in the furnace. The use of sheet alloy covers (not sealed retorts or boxes) for tem-

peratures below 1800 deg. F. deflects a large part of the gas away from the steel and is effective in reducing scale formation where they can be satisfactorily applied. Compounds in which the steel pieces are dipped before heating are also effective but are economical in only a limited number of cases.

With the foregoing outline of scaling, or the oxidation of iron, in mind, the parallel phenomenon of decarburization, or the oxidation of carbon, in open fired furnaces can now be considered. Each reaction is closely associated with and enormously complicated by the other, so that a study of decarburization is impractical without an understanding of scaling. Both reactions are affected by the same factors to varying degrees, and the net decarburization, after removal of scale, is determined by the relative speed of reaction as the result of the combination of factors present in any case.

A repetition of these factors, as they affect decarburization is as follows:

(1) Fuels—It is known that CO₂ and the combination of hydrogen and water vapor are decarburizing to steel, and since the amount of these gases produced per unit of heat in the fuel varies with the different fuels, it follows that the decarburizing tendency will vary for these fuels. Calculations of the quantity of water vapor and CO₂ in the flue gases from the perfect combustion of sufficient fuel to release 1,000,000 B.t.u. show the comparisons

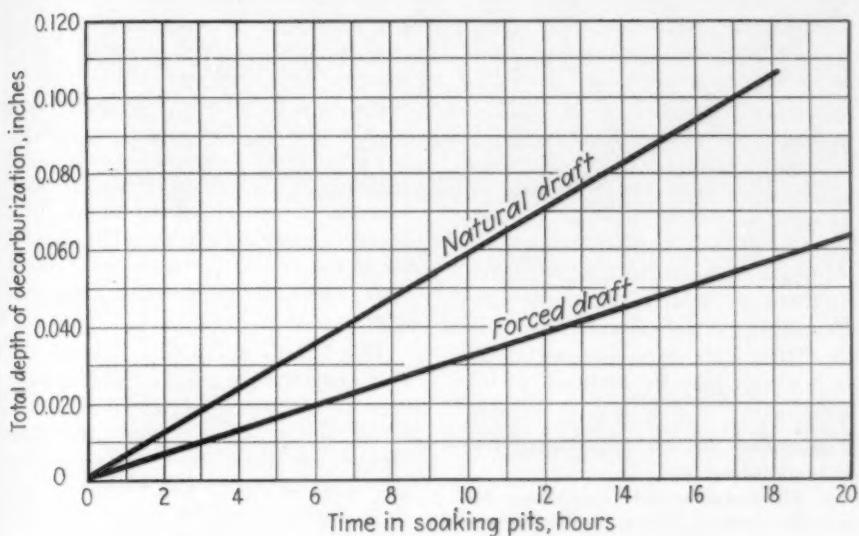


FIG. 1—Graphical presentation of the data shown in Table I on decarburization in soaking pits. Note that the decarburization is corrected to a 300 per cent area increase. The improved results obtained can be accounted for only by the improved control of furnace atmosphere with forced draft.

for different fuels which follow. The practical comparison of fuels will be further discussed under specific examples.

The cubic feet of water vapor and carbon dioxide per 1,000,000 B.t.u. for coke is no water vapor and 2180 cu. ft. of carbon dioxide; for bituminous coal, 685 cu. ft. water vapor, and 1930 cu. ft. carbon dioxide; for fuel oil, 1295 cu. ft. water vapor, and 1530 cu. ft. carbon dioxide; for tar, 712 cu. ft. water vapor (steam atomizing adds about 133 cu. ft. of water vapor), and 1870 cu. ft. of carbon dioxide; for butane, 1560 cu. ft. water vapor, and 1248 cu. ft. carbon dioxide; for natural gas, 2020 cu. ft. water vapor, and 1120 cu. ft. carbon dioxide; for city gas, 2394 cu. ft. water vapor, and 1048 cu. ft. carbon dioxide; for coke oven gas, 2230 cu. ft. water vapor, and 1058 cu. ft. carbon dioxide; for raw producer gas, 950 cu. ft. water vapor, and 2050 cu. ft. carbon dioxide; for anthracite gas, 1213 cu. ft. water vapor, and 1861 cu. ft. carbon dioxide; and for blast furnace gas, no water vapor, and 3080 cu. ft. carbon dioxide.

(2) *Furnace pressure*—It has been established that free oxygen from the air (as contrasted with nascent oxygen from combustion) is almost as decarburizing as wet hydrogen and more active than CO_2 in removing the carbon from most steels. The difference between this free oxygen in air entering the furnace through doors,

cracks, and other openings, and the nascent oxygen resulting from an excess of air supplied through the burners is just one of the many confusing facts relating to this subject. The only method of preventing the entrance of this free oxygen is to establish and maintain a pressure in the furnace which is slightly higher than atmospheric pressure in all parts of the furnace. This pressure should be about 0.01 in. water at the lowest point in the furnace and is maintained by controlling the outlet flues of the furnace to suit variations in the fuel supply. This may be accomplished in some cases by a simple connection between the flue damper and doors or control valves, but in most instances the standard automatic furnace pressure control systems are the best solution.

(3) *Temperature of the steel*—In general, the tendency to decarburization increases with temperature because the reaction between the carbon and the gases of the furnace is increased by increase in temperature. However, the oxidation of iron also increases with temperature, and there are cases where a reduced decarburization after removal of scale is found with higher temperatures, because the scaling has been increased to a greater extent than the decarburization. A third phenomenon—the diffusion of carbon from unaffected areas to decarburized areas—also affects the final

result, and the effect of temperature on this factor is not as yet well understood.

(4) *Air-gas ratio*—The ratio of air to gas as supplied to the burners in open furnaces has a large effect on the resulting decarburization because it directly affects the analysis of the furnace gases. With the so-called reducing atmosphere resulting from a deficiency of combustion air, a part of the hydrogen in the fuel is oxidized to water vapor and the remainder appears in its original form, with a resulting wet hydrogen which is the most active of all decarburizing combinations. The carbon of the fuel appears as both carburizing CO and decarburizing CO_2 , at a ratio in most cases that is a decarburizing combination. With an excess of air, all of the hydrogen appears as water vapor, a less active decarburizer than when in the presence of hydrogen, and all of the carbon is combined in CO_2 . Nascent oxygen is present which increases the formation of scale. In general, it is indicated that the net decarburization after removal of scale is at the minimum for most steels when the air-gas ratio is on the slightly oxidizing side.

(5) *Type of Burners*—Premix burners with thorough mixing and high flame temperatures consistently produce the lowest decarburization in the author's experience, probably because of more complete combustion of the fuel before contacting the steel and because of the dissociation of combustion gases by the higher burner port temperatures. Similar results are also indicated from furnaces which are designed with hot combustion chambers (indirect fired furnaces) for the same reasons.

(6) *Per cent reduction after heating*—For most higher temperatures the problem of decarburization arises in connection with the heating for rolling or drawing in which the section of the piece as heated is reduced in forming. This reduction increases the surface in the finished piece and correspondingly decreases the thickness of the decarburized skin formed in heating. Decarburized depth of finished pieces cannot properly be compared unless corrected for this increase in area in each case.

For example, the area of the sides of a 4x4-in. billet 12 in. long is 192 sq. in. If this billet is rolled into a bar of 1 in. diameter, the length becomes 245 in. and the new area of the surface is 770 sq. in. The increase in area (or decrease in depth of decarburization) will be 400 per cent. In

other words, the depth of decarburization on a 1 in. diameter round when rolled from a 4x4-in. billet will be about one-half as great as on a 2 in. diameter round from the same billet, and about one-fourth of that on the billet after heating but before rolling. On low temperature processes for annealing, hardening, normalizing, etc., the factor of reduction or increase in area is usually not involved.

(7) *Time at Temperature*—Decarburization is always increased by greater length of time at temperature, since the nature of the reactions involved is such that they are gradually progressive with time.

(8) *Steel analysis*—As will be shown by test results to be discussed, the analysis of the steel has a great affect on the amount of decarburization under any conditions, which is a further complication because the amount of data necessary for any broad understanding of the subject is enormously increased. It will be a long time before any correlated understanding of the effect of the many other factors will be definitely known for the wide

range of steels from the low-carbon to the high-carbon steels, high speed, various alloys and alloy combinations, and stainless steels.

With this outline of the factors involved in the decarburization of steel, and with the simultaneous scaling action to some extent understood, it is now possible to more intelligently examine certain scattered evidence concerning decarburization in different furnaces, which the author has collected over a considerable period of time. These data were obtained in furnaces which may be outlined as follows:

For soaking pits, to heat ingots, fired with raw producer gas.

For batch-regenerative (reversing) furnace, for heating billets, fired with raw producer gas, coke oven gas and natural gas.

For batch-burner fired furnaces, for heating billets, fired with coke oven gas, natural gas, coal, and fuel oil.

For continuous pusher furnaces, for heating billets, fired with producer gas, and natural gas.

For batch-car type furnaces, for annealing, fired with coke oven gas and natural gas.

Data collected for soaking pits included results from four grades of steel, each heated in a standard regenerative, reversing pit with natural draft, and in an identical pit except for the provision of forced draft from a low pressure fan which makes it possible to maintain a slight positive pressure in the pit at all times. The fuel was producer gas in all cases, and all of the results tabulated in Table I were checked by several additional tests.

The figures of Table I indicate the very considerable effect of the furnace pressure in preventing the infiltration of free air into the furnace. All other factors remained the same in each case, and the improved results in decarburization can be accounted for only by the improved control of furnace atmosphere with forced draft. Fig. 1 shows the data in this table in graphical form.

Ed. Note: — Next week the author will present data on decarburization in all the other types of furnaces mentioned above.

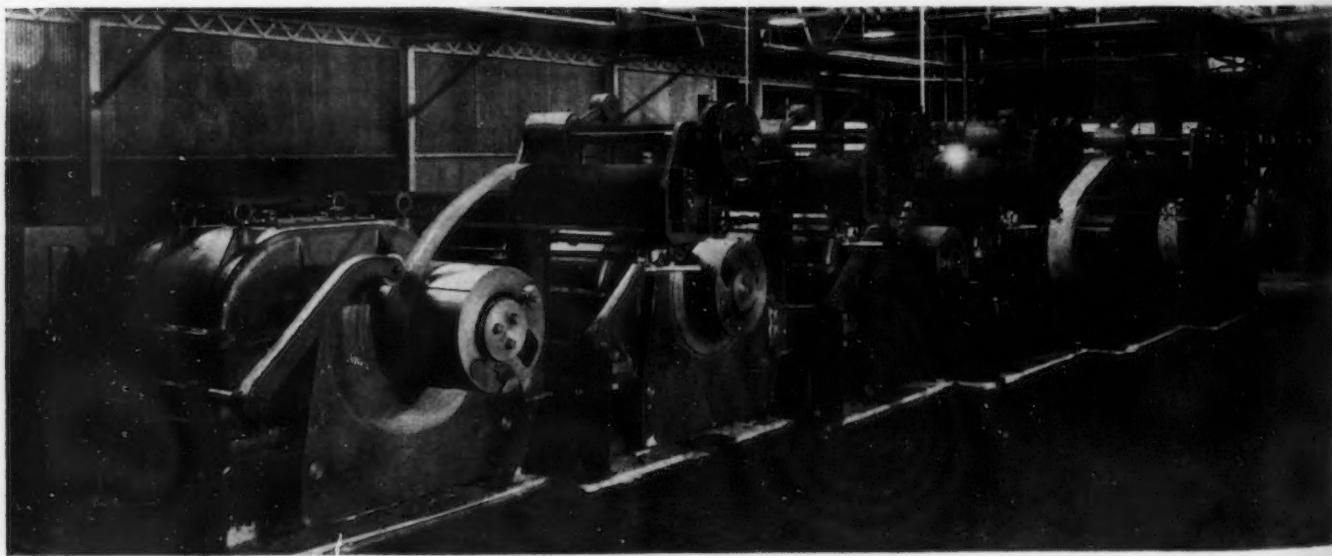
Reel Drums Controlled Independently

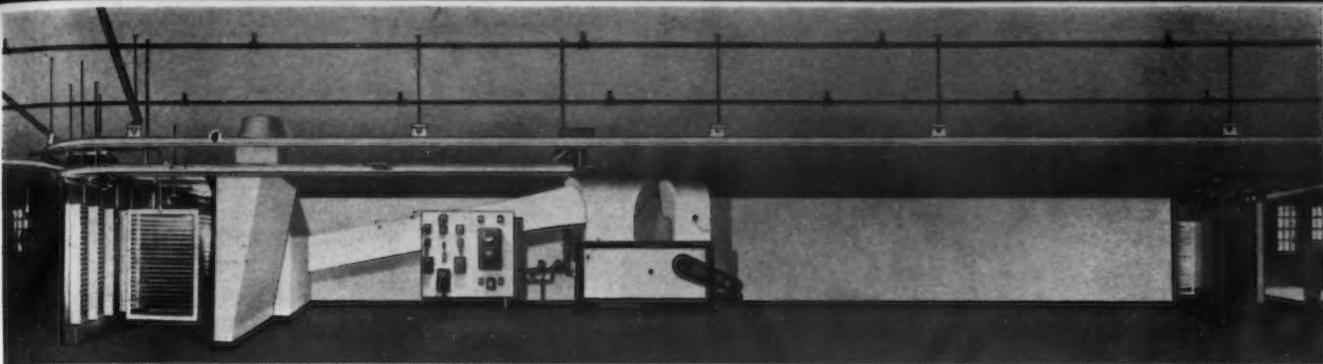
THE accompanying illustration shows an installation of reel drums driven by gearmotors, at the Superior Steel Corp., replacing a former one driven by motors coupled to speed reducers. There has resulted the use of a minimum of floor space and a low cost of installation and operation. As many as six coils are

drawn through a cleaning bath at independent speeds from 15 to 60 ft. per min. Manual field control determines the speed of each motor and the changing coil speed, as it builds up on the drum, is compensated for by means of variable voltage applied to the gearmotor armature, and is controlled by a rider rheostat acting on

the field of its particular generation.

This installation uses Westinghouse gearmotors in a battery containing two 7½ hp., two 10 hp., and two 15 hp. units with a reel drum of 20 in. in diameter mounted directly on each of the slow-speed shafts. These units have capacities of 2000, 4000, and 6000-lb. coils respectively.





CONTINUOUS enamel drying oven for steel signs. The heater unit and control panel are shown near the middle. At the left is the cooling zone, which extends out from the furnace a distance of 25 ft.

OVEN REPLACES AIR DRYING

AN interesting oven installation is in operation at the plant of the Massillon - Cleveland - Akron Sign Co., Massillon, Ohio, for baking synthetic enamel coatings onto steel signs. The signs vary in size up to 4 ft. wide by 12 ft. long, which makes the installation unusual, since this is the first fully automatic unit devised for such large size signs. The entire system has been in satisfactory operation for six months.

Prior to the installation of the automatic equipment, the signs were air dried in large wooden racks which were trucked about by means of platform trucks. Depending on weather conditions, the drying time ranged up to two days per coat. Sometimes on a multi-color sign job the time in process has added up to 14 days. The old method was not only slow but also cumbersome and costly.

The new equipment, which was designed and installed by the Morrison Engineering Corp., Cleveland, consists basically of an automatically loaded hydraulic elevator, panel type convection heated recirculating oven, cooling zone, Tramrail system, power conveyors, and control systems.

To actually transport the signs throughout the various stages of the system, large steel racks were provided. One of these racks is shown emerging from the furnace, at extreme left, in the accompanying illustration. Each rack measures 12 ft. 4 in. wide by 4 ft. 2 in. deep by 5 ft. 9 in. high and holds a maximum of 20 4 x 12 ft. signs. Each rack will hold up to 120 smaller signs at one time. The racks are equipped with two 4-wheel Cleveland Tramrail trolleys.

The oven proper is 74 ft. 6 in. long by 15 ft. 3 in. wide by 8 ft. 9 in. high, and is built up of 4-in. interlocking

oven panels for walls, roof and floor. The entrance and exit openings for the work are on the side of the oven (see illustration), and are closed by means of automatic roll-type doors, synchronized with the operation of the conveyors.

At the exit end of the oven a 25 ft. 6 in. long cooling zone is provided to bring the freshly baked signs to room temperature. Cold air is taken from the roof and passed through air filters into streamlined high pressure ducts, by means of a high pressure blower.

The loading elevator consists of a stationary structural frame within which rides the elevator bridge. The bridge is held in position by cables which in turn are operated by a hydraulic cylinder which operates automatically in conjunction with loading conveyors.

The oven proper is equipped with a double strand floor type pusher conveyor intermittently operated, which engages the racks and propels them through the oven in a crosswise position.

The floor conveyor is driven from a motor through a Reeves variable speed pulley unit to a double reduction worm gear reducer equipped with a Mercury Torque limiting clutch. The clutch to headshaft drive is conventional drive chain. The Reeves unit gives flexibility of travel within the oven and the Mercury clutch prevents jamming of racks by limiting the torque to that value required to start and move the load.

Conveyor operation is controlled by a variable sequence timer which directly starts the floor conveyor at predetermined intervals. The movement of the floor conveyor actuates the two runout conveyors which deliver the rack to the cooling zone in synchron-

ized movements. The only manual step in the operation of the system is the pushing of the empty rack onto the elevator and the pushing of the loaded rack into the oven. All other operations are done automatically, except unloading of the racks.

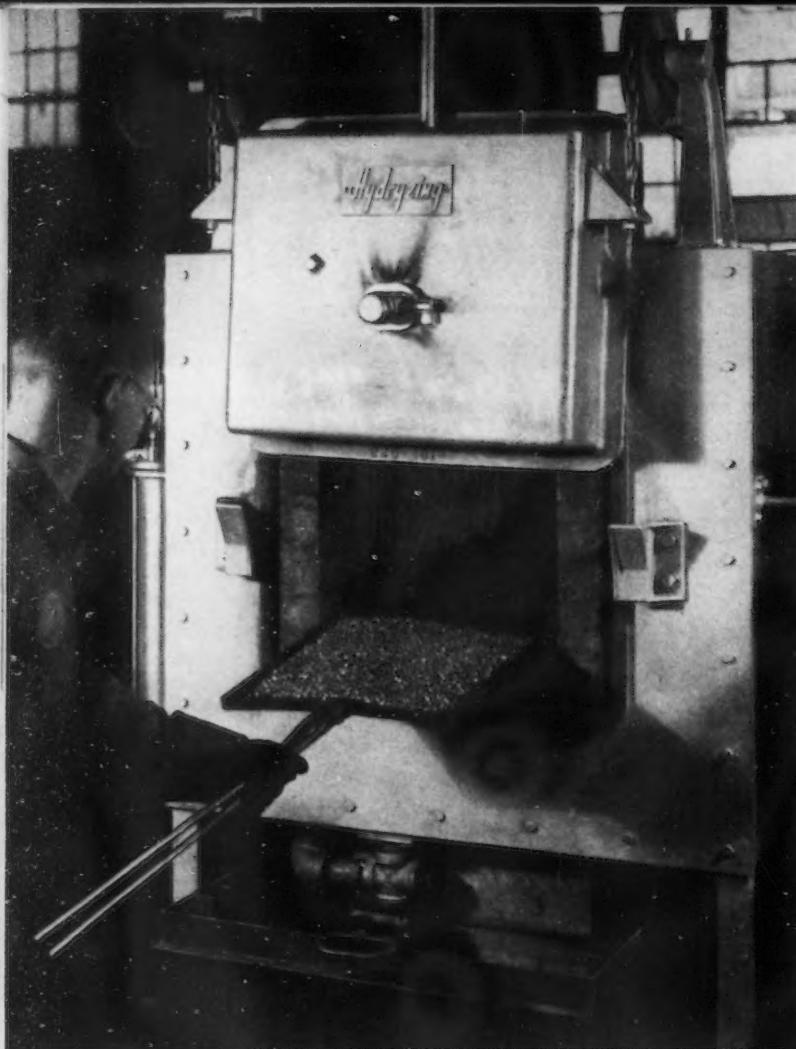
At the exit end the racks are propelled by two synchronized overhead pullout conveyors which automatically transfer the rack from a crosswise position in the oven to a longitudinal position in the cooling zone. The change in position is done through the use of electrically operated Tramrail switch gear. From this conveyor the racks are transferred to another conveyor which delivers them to the unloading zone, where the signs are manually unloaded and the racks are then delivered to the loading elevator for the next cycle.

The oven and system have a capacity of 27 racks per hr., with baking cycles variable from 45 min. to 2½ hr. The temperature ranges from 200 deg. to 350 deg. F. maximum. The fuel used is low pressure natural gas. A Morrison direct gas-fired air heater with special large volume fan is the prime heat source.

The oven control is incorporated in a cabinet. The features of this cabinet are delayed purging, automatic ignition and automatic protection against fan, power, control, air or gas failure. The control system for the oven and also interlocked automatic sequence control of a total of 33½ hp. in electric motors is centrally located on an independent control board.

The Massillon-Cleveland-Akron Sign Co. reports improved luster and finish of each sign, which has increased the weathering life of its signs for the same quantity of paint as heretofore used.

BRIGHT HARDENING OF SMALL PARTS



LOADING a tray of small parts into a Hydryzing furnace. The quench tank is below.

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ANY heat treater is intensely interested in a process permitting loading of parts into a hardening furnace and bringing them out hard with their original shiny surfaces. Particularly has this applied to small production parts such as springs, stampings, and the many varieties of screw machine parts which are hardened to resist wear.

Development of the new Hydryzing process for hardening, by the Lindberg Engineering Co., 228 North Laflin Street, Chicago, makes available to the smallest heat treating shop a process claimed to harden such parts absolutely bright with no trace of scale or discoloration. In fact it is said to be virtually impossible to distinguish by appearance whether or not the parts have actually been hardened. Originally developed at the plant of the Lindberg Steel Treating Co. for the treatment of tools and dies, the Hydryzing process was found to provide

so effective a protection to heavier work of that nature that a modified furnace has been designed which embodies features which would enable it to be used for the bright hardening of small work in addition to the regular run of tools, dies, and costlier type of parts. Bright hardening of small parts is said to have actually been found to result in considerable production savings, not even considering the very great improvement in the appearance of the finished work.

The first saving claimed is in the amount of handling which is eliminated. Generally, when a reasonably scale-free surface has been necessary one of two different methods has been used. The parts were either pack-hardened, or hardened from a molten bath of some type; both involve considerable handling in order to prepare the parts for hardening. In the case of the first method, the packing of the parts in some carbonaceous material

such as pitch-coke, charcoal, or bone-black is required, and this operation must of necessity be carried out manually. In the case of hardening in a molten bath, the parts must be wired together so that they can be immersed in the bath without tending to float to the top. Due to dust and dirt, working conditions in the case of pack hardening are not at all favorable, and the same holds true in the molten salt method where the hardener must contend with heat and fumes as well as the ever-present hazards of splattering salt due to small quantities of moisture on the work.

In spite of these disadvantages, a much greater hazard is present in both methods, and that is the difficulty of maintaining neutral hardening so that the parts are neither carburized nor decarburized, and particularly the former. Even a slight carbon pickup will result in a brittle part which has little resistance to fatigue, and a carbon case, however slight, often renders the part useless because of the resultant brittleness. In the Hydryzing process all packing and wiring together of parts is eliminated because the work is merely loaded onto the furnace hearth in the normal manner. Secondly, the Hydryzing atmosphere

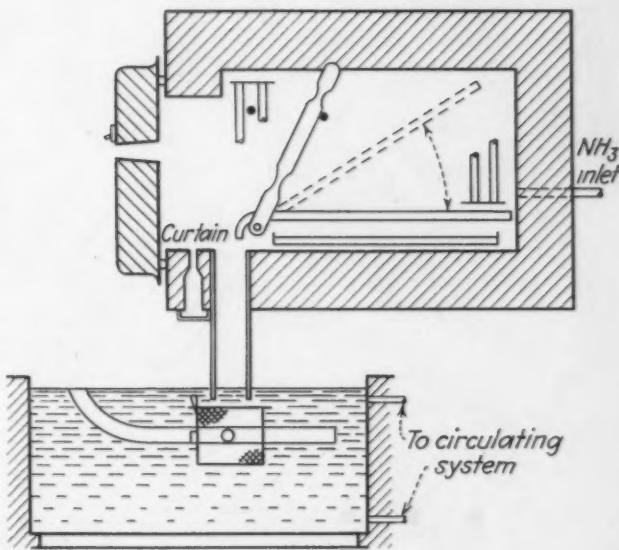
is said to completely protect the parts against either pickup or loss of carbon so that physical properties can be consistently maintained as specified.

Because the surface of Hydryzed work is bright and clean, no pickling or cleaning operations such as sand-blasting are considered necessary. On some types of work, such as gears or heavier work where the unit costs run comparatively high, the elimination of cleaning cost is of little importance. However, on production items such as springs and stampings, where the unit costs may run in fractions of pennies, the elimination of cleaning or sand-blasting, and the extra handling incidental to those operations invariably results in substantial savings because these expenses bear a larger percentage of the total cost than they do in the case of parts whose cost is reckoned in dollars rather than pennies. It is also recognized that blasting or pickling frequently produces minute pits in the surfaces of the parts which not only reduce the luster of the finished work, but, in the event that the parts are later plated, these small pits make it more difficult to secure a smooth and shiny plating job.

Considerable difficulty has always been experienced in pack and salt-bath methods in hardening light section springs of thicknesses from 0.006 to 0.015 in., for example. Here, if the parts are scaled during hardening the loss of total cross-section may be so great as to weaken the spring to a dangerous point. The loss of 0.001 in. due to scaling during hardening is not at all uncommon, and such a loss on a spring of 0.006 to 0.010 in. thickness is prohibitive. By retaining the original surfaces intact, Hydryzing is said to make it possible to harden such work without the slightest danger.

A protective gas screen or curtain is introduced at the front of the furnace chamber so as to effectively seal the chamber against the entrance of the unwanted outside atmosphere. The gas for this curtain is produced in a charcoal generator. This is a comparatively simple unit consisting of an insulated cylinder, lined with firebrick in which air, supplied by a small blower, is passed through a bed of burning charcoal. An additional, and most important, effective feature is the very tight door sealing device which insures tight seating of the door when it is in the closed position, thereby preventing the entrance of oxygen and also preventing the escape

TILTING-
HEARTH
Hydryzing furnace with quench.



of the gases from the furnace chamber.

Ordinary anhydrous ammonia, the same as used in refrigerating plants, is introduced at the rear of the furnace chamber. The flow of ammonia is controlled by a small needle valve, and consumption is so low that a 100-lb. tank lasts between 2½ and 4 months, depending on the size of the furnace required.

Accurate records kept on a number of Hydryzing installations are said to show an average cost of approximately 8½ to 10c. per hr. of operation for the protective gases. This figure, of course, does not include energy for the heating elements in the furnace chamber.

It is pointed out by the company that bright hardening can be carried out in shops having even the most limited production, as standard furnaces are available with chamber dimensions of 10 in. wide x 18 in. deep x 10 in. high and larger, and the fact that this type of Hydryzing furnace not only takes care of the bright hardening of springs, stampings, and other small parts but also the hardening of all types of tools and dies, makes it a useful furnace for the average hardening room.

In order to secure perfectly bright

surfaces in hardening, it is necessary not only to protect the work against scaling while it is being heated, but also while it is being quenched. To take care of the latter a simple tilting hearth arrangement was developed so that when the hearth is tilted the parts drop through a sealed chute at the front of the furnace chamber and down into the quench. The bottom of the chute extends into the quenching medium and is therefore sealed so that no air can enter it and discolor the work. The hearth is tilted by means of a lever on the side of the furnace. When tools or dies are being treated the hearth remains in the horizontal position.

In addition to the bright hardening of steel parts the Hydryzing process is said to be effectively used in the annealing of non-ferrous metals, particularly copper. Recent installations for this type of work include a furnace at the plant of one of the country's largest gasket manufacturers, where considerable difficulty is said to have been experienced in annealing copper washers to a dead soft condition. The Hydryzing unit brings the washers out with an absolutely bright, true copper finish, and a great deal of expense has been eliminated in the form of tedious pickling operations to remove scale.

CEILING TO WAGES- ESSENTIAL CON- TO A SUCCESSFUL

BY HERBERT S. SWAN

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DURING the past few years there has been much talk about establishing a floor to wages and a ceiling to hours of workers in industry. Concrete expression has been given to this idea not only by the national Wages and Hours Law and the minimum wage acts of different states but by hundreds of union contracts.

Minimum wages today are progressively being subjected to ever increasing maxima, and maximum hours to steadily decreasing minima, until the average worker has more than a fair amount of justification for feeling that wages and hours are more a matter of fiat than of economic law. Under such circumstances it may not be amiss to examine anew some of the fundamental aspects of the wages and hours problem.

There is undoubtedly a floor to wages and a ceiling to hours. *But how about a ceiling to wages? And a floor to hours?* Maximum wages and minimum hours are as important considerations in the proper solution of industrial relations as minimum wages and maximum hours but as yet they have received very little study.

Wage Scales

Most wage scales in union contracts are based upon either hourly rates or piece rates.

Straight time, the most commonly used plan, as well as the most simple plan, is most readily applied to unstandardized work, the product of which per employee cannot easily be metered. Under this plan the unit

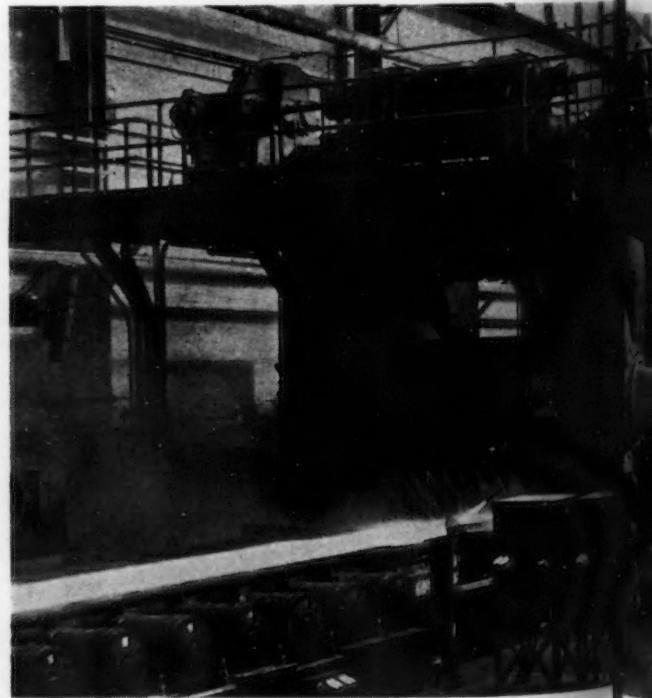
costs are high at low production and low at high production. Production per employee is, however, usually low. Unit costs are, therefore, generally high. Unit costs tend, moreover, to increase during slack periods.

Piece rates may be almost as simple as time rates. They have the advantage over time rates in that they afford a constant unit cost of production. They also offer a greater incentive to capable workers since earnings, instead of depending upon motion of the clock, rest upon their own effort and skill. Piece rates are particularly available for work of a steady, repetitive character and for independent tasks capable of being performed by an in-

dividual worker acting alone. In some instances piece rates are supplemented with guarantees of a minimum time rate.

Setting and maintaining a rate, whether a time or a piece rate, in a manner fair to both worker and employer is a matter of considerable difficulty in every industry. Seldom does either side analyze its problem in a scientific and businesslike fashion with reference to what the industry can on the basis of past operating experience afford. The rates struck are usually rule-of-thumb rates representing not so much something based upon the measured output as merely the maximum concession the negotiating com-

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FLOOR TO HOURS...

ONSIDERATIONS WAGE POLICY

CONSULTANT, NEW YORK

mittee for labor could wring from the employer.

Sometimes the piece rate schedule is supplemented with extras which are set up when new styles are introduced, not because their production requires special effort or skill but because of the higher price obtained for highly styled merchandise. At a later stage in the style cycle, when the innovation has, in effect, become standard merchandise, the market quotations also become normal and the premium in price heretofore commanded by the product on account of novelty is dropped. But the extra wage rate continues as an added cost to burden production.

Even where the introduction of a

product may require an added effort on the part of the worker initially, the extent of the additional effort is reduced as the product becomes more standard and production methods more refined. With the installation of new machines of an improved type the rates may actually become obsolete. Rates evolved for present machines may be wholly inapplicable on improved machines and may, indeed, even impose an obstacle to the future use of modern equipment, thus burdening the industry with obsolescent machinery.

Extras for new styles are necessarily set up on the basis of prior production experience. After the rate is set refinements in methods or ma-

chines may result in such increased production as to convert the extra into a preferred rate, favoring the operators of particular machines who may not be more skilled than many fellow employees. The effect in such a case is to set up a privileged group with higher earnings than those received by other workers of equal skill, responsibility and experience.

Every wage rate scale set up tends to get out of adjustment immediately after it has been put into effect. These maladjustments need be constantly watched and eliminated insofar as possible if unnecessary burdens are not to handicap either the workers or the industry.

In a highly mechanized industry, the relative importance of wages is reduced; that of overhead—interest, depreciation and obsolescence of machinery — greatly increased. The greater the overhead content in the per unit cost of the product, the greater is also the need for high production in order to market it at a low price. In order to meet this situation various bonus or incentive plans have been worked out which have as their object increasing output through rewarding the worker for performances above task where most production is expected to take place. Leaders of organized labor, desiring workers to feel more dependent upon union contracts than upon their own efforts in securing increases in pay, have quite generally opposed incentive plans. Such plans are to be found, therefore, mostly in unorganized shops.

In discussing wage rates it may be

... labor saving devices are installed in the basic industries so that both labor and purchasing power may be released for the manufacture and distribution of new goods for which there has previously been either a very limited or no market."

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... only as the common laborer emerges into a skilled workman does he obtain a certain security against the more intense price competition always threatening the wage level of the unskilled masses."

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well to remember that low hourly rates do not necessarily indicate low labor costs. Nor need high piece rates produce high earnings. Both may reflect low standards of efficiency. Incompetent labor is usually, regardless of its rate of pay, high priced labor. Its employment, instead of being an asset to industry, is frequently the most formidable obstacle to its successful conduct. The financial success of plants in low wage centers is often due not so much to labor costs as to the use of up-to-date machinery, better organization and superior management.

Differentials Based on Skill

Adequate wage differentials based upon differences in skill are an essential requirement of every satisfactory wage policy. Differentials, reflecting in a manner acceptable to the average worker the varied requirements of skill, training, responsibility and effort

associated with different jobs ranging from common to highly technical labor, constitute the strongest incentive to the development of skill for it is the higher standard of living and increased social prestige which accompanies a larger pay envelope which prompt an individual to assume the necessary self-discipline incident to becoming a trained mechanic.

In the past, everybody concerned with industry, management no less than labor, as well as communities in which workers live, has paid entirely too little attention to the need for developing skill-man-power. Workers in communities built upon the industrial exploitation of unskilled labor, always in competition with hordes of unskilled workers both at home and abroad, are usually paid but a bare minimum subsistence wage. No matter how low their wage, there are generally some, hungrier for work than

they are, willing to work for less. The small buying power possessed by such labor confined to the basic necessities of life leaves small margin for the purchase of those comforts which measure the cultural advancement of a community.

Only as the common laborer emerges into a skilled workman does he obtain a certain security against the more intense price competition always threatening the wage level of the unskilled masses. Common labor, being interchangeable with little or no special training, is available to all industry. Every laborer is, therefore, to a greater or less degree, competitive with every other unskilled workman. But this is not so with the trained mechanic. Although he is competitive with other mechanics within his own group, he is not interchangeable with mechanics outside his particular group. A lathe operator is not available for the job of a lithographer; a cabinet maker is ineligible for the job of a textile printer. It is only through the development of a special skill that each individual worker can protect himself, his job and his wage from the keen competition surrounding the employment of common labor.

The wage differentials essential to the development and maintenance of this skill are today being impaired, it is feared, by the negotiation of many union contracts which, through the adoption either of flat increases of so much per hour or per week or of inverted scales of graduated increases, have the effect of narrowing differences in pay to skilled and unskilled workers. This is particularly true of industries in which skilled workers are in a small minority. There the shop committees appointed for collective bargaining have sometimes been more interested in satisfying the increased wage demands of the majority of unskilled workers than in maintaining wage differentials requisite to perpetuating the group of highly skilled workers in the industry. In some instances wage differentials have been whittled down to a point where they are insufficient to retain the superior ability to man the industry.

Rigid Work Week

With a work week of flexible length, increased production may be reflected, not through increases in the number of employees, but through a lengthening of the work week. But with a standardized work week of 36 or 40 hr., increased production must, once those on present payrolls are employed full time, be accompanied with a corresponding increase in the number of

employees. For full time new permanent employees, this is as it should be. But rigid union contractual regulations rigidly enforced insist upon this principle being observed even in the case of industries subject to sharp seasonal fluctuations where a limited amount of overtime on the part of regular employees for short periods would make ample provision for temporary production requirements. Management, forbidden to work regular employees overtime, must hire new workers requiring considerable training and increased supervision. In such cases the man hours per unit of product often shoot upward with increased production, showing that the added efficiency which should be obtained with expanded operations has been offset by the less efficient effort of new workers.

The principle of a fixed work week may be so rigidly applied as to produce an utterly impractical situation within an industry both as to management and labor. Unless some measure of administrative flexibility is provided to make necessary adjustments for above-standard and sub-standard employment cycles in the way of an elastic week, the industry is forced into multiple shifts or the employment of extra help which may in time become invested with certain permanent rights as stand-by help. The presence of such surplus workers serves in many instances to accentuate fluctuations in the employment of regular employees, taking work which rightfully belongs to them and giving it to half-starved unnecessary supernumeraries on the fringe of the industry.

Plant Modernization

A worker's productivity can seldom be considered separate and apart from other factors contributing to production in an industry. Since "employee productivity" is in fact productivity of the whole industry averaged over the number of employees, the ability of the employee is often secondary to general conditions under which he works in determining production. Character of tools, capacity of machines, quality of materials, adaptability of buildings, effectiveness of management and such considerations are often quite as important as the worker's own competence in controlling the output per worker.

Wages are generally highest where capital per employee is utilized in greatest volume. The installation of modern efficient machinery, in reducing unit costs and thereby promoting increased production, constitutes an essential prerequisite to the payment of satis-

factory wages. As the retention of obsolete machinery imposes a heavy drain upon wages, labor should be the first to recognize the need for harmonizing wage policies with the requirements for modernizing plant and equipment. And yet limitations upon work loads or detailed standards and extras regulating wage scales found in union contracts are among the most obstinate hindrances encountered to the modernization of different industries needing new machinery.

Occasionally union rules oblige employers to stagger displaced help resulting from the introduction of labor saving devices. The consequence is that the economies which a program of modernization would effect are held in abeyance since new machinery, which would otherwise be installed, is not purchased. In such instances, employers are inclined to take the view that there is no use buying machines which would displace men when they would still have to provide full time employment for the displaced help.

Wages, being paid out of the worker's own productivity, can be raised permanently only through increased production on the part of labor; increases in hourly rates can be maintained solely through increased output. Unreasonable work load limitations, undue interference with management in securing effective use of labor, soldiering on the part of the worker—all are disastrous to efficient and economic production, and therefore to payment of satisfactory wages. The fatal idea that restriction of output increases wages dies hard.

Labor Saving Devices

The introduction of labor saving devices in the basic industries has had and is still having a most profound effect upon the whole industrial structure; for it is only as such devices are installed that both labor and purchasing power are released for the manufacture and distribution of new goods for which there has previously been either a very limited or no market. If the price of the products made by the particular industry introducing the labor saving device is reduced, it may result in the development of so much larger a market for its products that both the labor and purchasing power released by the new invention or process may be absorbed within the industry itself. But the market of the industry utilizing the new device may be unable to absorb such an increased volume of goods. In that event the displaced workers will be available for employment in new industries and the

wages heretofore paid them released for the purchase of new merchandise.

Axiomatically, labor saving devices will not be installed unless their use is accompanied with a sufficient reduction in labor costs to justify installation. Their introduction must, therefore, in the long run be reflected in a displacement of labor.

Should a technological change reflect itself in such an abbreviated work week as to retain present employees in the industry, its benefits will be spent in affording workers increased leisure. Over the years, the work week has been reduced from 60 and 70 hr. to its present length of from 36 to 44 hr. through a partial absorption of these benefits. In all successful industries the shortening of the work week has always followed, never preceded, technological advance. In other words, the productive efficiency of the industry has outstripped the reduction in working hours. Should the reverse occur and the decrease in working hours proceed faster than the gains in operating efficiency, the resulting increase in cost of goods would effect such a reduction in production as to produce widespread unemployment and ultimately a very probable decrease in total wages paid by industry.

When the hours of labor in an industry have been reduced to a work week of reasonable length, a length in no wise prejudicial to either health or well-being of employees, a further decrease in hours can, as a rule, be effected only through a reduction in the standard of living maintained by the worker. When increased leisure of the worker is paid for, not by increased productivity of industry, but by diminished consumption of goods by the worker, the reduction of working hours has obviously been pushed to limits socially undesirable. The broader marketing of present products no less than the development of new products depends upon a steady increase in the general standard of living.

Instead of supporting a higher standard of living, the increased productivity of labor developed through the application of greater skill or the introduction of more efficient tools may be utilized to maintain a larger population. The birth rate may be increased to produce a population proportionately as much larger as the added yield of the new technology. In case the larger population appropriates all the gains made in industry, there will be no increase in wages, no reduction

(CONTINUED ON PAGE 96)

"AIR CONDITIONING"

OF WOODWARD PIG IRON

THE air conditioning equipment, made by the Carrier Corp., Syracuse, N. Y., which for the past several months was being installed on one of the Woodward Iron Co. blast furnaces, Birmingham, has just gone into operation. The company is looking forward to significant and profitable results from this new technique in southern iron manufacture.

Comparatively simple and relatively inexpensive the new equipment will, it is believed, have three definitely beneficial results: (1) a more uniform production of iron, which is the chief objective; (2) reduced coke consumption per ton of iron made; and (3) increased iron production without additional costs.

Of course, the air conditioning does not mean that furnace workers will have a cool and comfortable place to work. Rather, as a result of cooling, the air blown into the furnace will have a greatly reduced, constant and pre-determined moisture content.

Particularly in the south, the inability of operators to control moisture content of blast air has long been considered a source of grave inefficiency. Well before the World War, several furnaces in the Pittsburgh district were equipped for dry blast, the water content of the air being reduced by freezing in a manner somewhat similar to the process employed by ice producers. However, these early installations were discarded as being unprofitable. But, from that time, furnace men have carefully noted progress in the air conditioning of buildings always with the idea in mind that new and less expensive attempts toward a dry blast could be made. Under the direction of H. A. Berg, president, Woodward Iron Co. some few months ago began a study of modern air conditioning and conceived it practical, at this time, to de-humidify air and



thus control the moisture content entering Woodward stacks.

To a casual observer there is little of complication in the Woodward process. On the furnace yard has been erected a small concrete building containing three chambers lined with piping punctured every few inches. This building has an open intake topped by a small piece of corrugated roofing (see illustration) to keep as much dirt and grit from the air as possible. Outside air is sucked into the de-humidifier at this point, the temperature of the air varying with the weather changes. On the first day of operation the air had a temperature of 85 deg. F. This air passes through a veil of refrigerated water in the three spray chambers, and the temperature drops to 40 deg. F. almost at once. This temperature drop can be pre-determined practically at any point, but 40 deg. is the base decided upon by Woodward.

After passing through the ice sprays, the air travels up to a storage retainer at about half-way to the blowing engine house, thence down two feeder lines into the blowing engines. The compressed air passes from the blowers through a pipe across the furnace yard to the furnace stoves. Re-heated in the stoves to a temperature required by the furnace, the blast then enters the stack.

Having delivered this moisture free air to the furnace Woodward officials

will find, they believe, that coke consumption will be substantially lower; for there will be no need of the large quantities of coke usually required to break down the water normally carried into a furnace by the blast. Quite naturally the cost of production will be reduced in proportion to the coke savings per ton of iron. Also, the need of less coke will permit an increase of iron ore charged, which will result in an increase in the production of iron per furnace at no increase in the cost of operation other than, of course, the cost of operating the de-humidifier. Although these two points are both desirable, Woodward's prime objective is to be able to produce a uniform quality of iron.

Southern iron producers have at all times in the past delivered to their customers precisely the quality of iron ordered. To do this, however, has at times required extra runs in order to secure a uniform product for the customer. The surplus production was good iron, but it might or might not fit buyer specifications, the result being a furnace carry-over until another customer came along who required iron of that analysis. By means of humidity control, this carry-over problem is expected to be minimized.

At this time only one Woodward furnace has been equipped with air conditioning. Carrier engineers believe that a unit should be provided for each furnace, it being held that the mere doubling or trebling of the present unit would not provide efficient or adequate service for the two other stacks. Woodward evidently expects to make no move toward additional air conditioning until the operation of this one installation is convincingly successful.

The complete installation consists of three parts. First, a de-humidifier: adjoining this, in a small brick build-

FIG. 1 (Right)—Front view of the centrifugal refrigeration unit, housed some 200 ft. from the de-humidifier building. Here, the water from the spray chambers is cooled to 40 deg. F. and returned to the spray chambers. Fig. 2 (Center)—Another view of the refrigeration unit. The two black pipes on the extreme left are the in-pipe and return-pipe for the cooled water.

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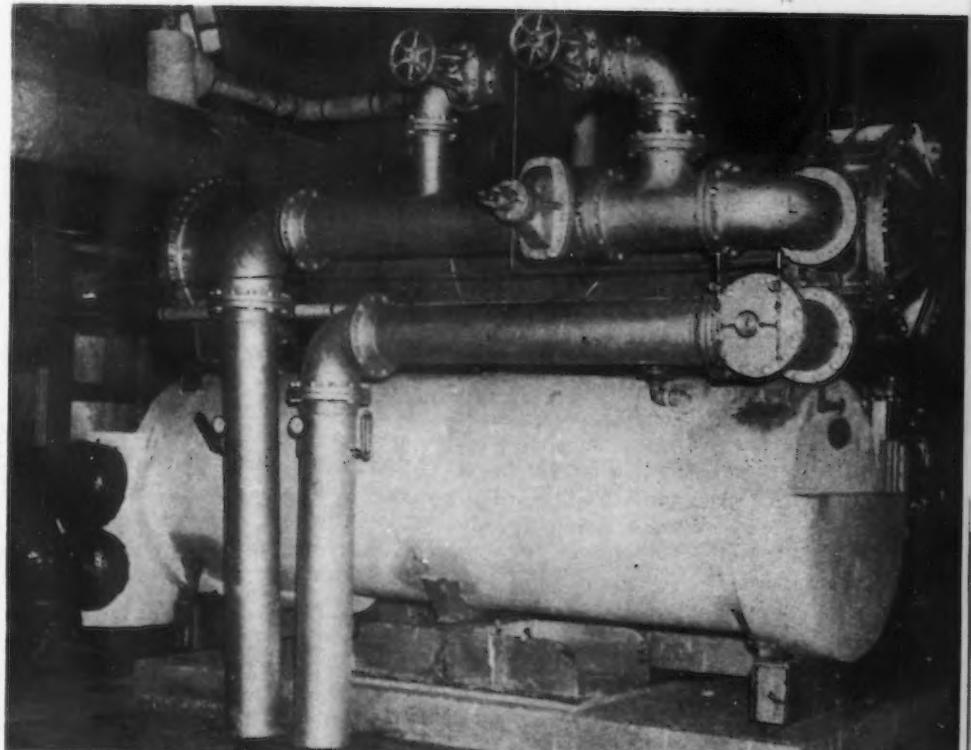
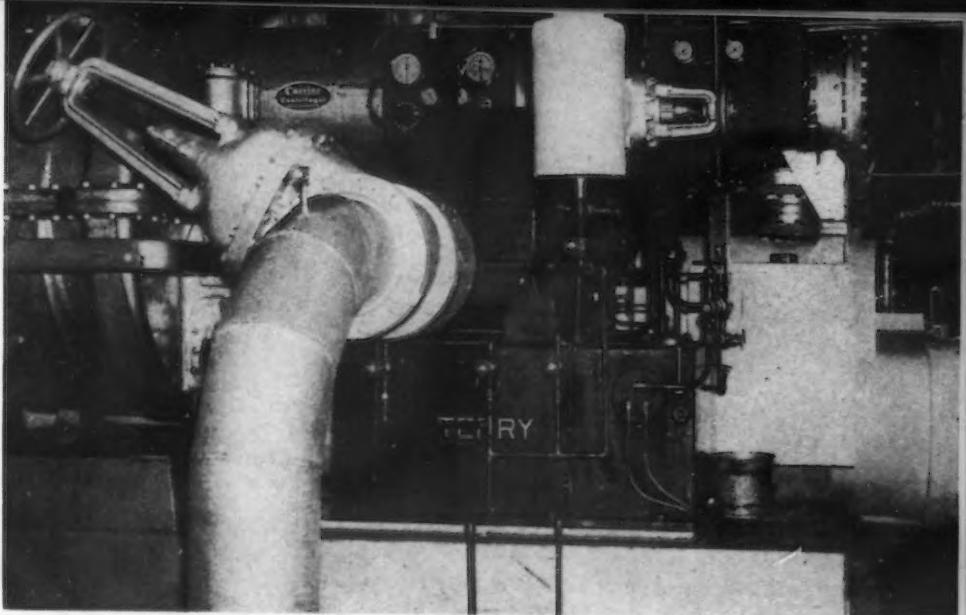
ing, are the pumps; the third part consists of a centrifugal refrigeration unit. The total cost is said to be \$75,000.

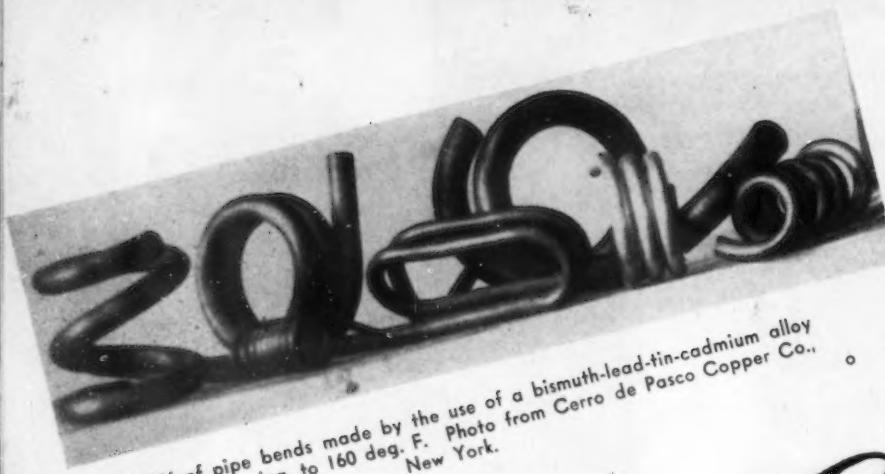
The process "squeezes" approximately 200 gal. of water per hr. from the intake air. This water, and the water in the spray chambers, picks up considerable heat from the intake air; the water constantly drops down into the pump room and is sent over to the centrifugal refrigeration unit where it is again cooled and routed back to the de-humidifier. Thus, the heat transfer cycle is completed. There is a constant increase in amount of water in the system, and in the interest of economy this excess water is sent to a storage well where it is later piped to various points of the property for other manufacturing purposes.

Although airconditioning will have a maximum potential advantage to southern operators, because of high summer humidities and large swings in temperatures, it does of course hold promise to operators in other sections of the country; for blast furnaces are usually located on river banks, and intake air very often is almost saturated with moisture, as for instance during periods of heavy fog.

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FIG. 3 (Right)—This de-humidifier building houses three spray chambers. The air intake is shown on top the building at the extreme right. The pump house is not visible, but is behind the de-humidifier. The air passes from the de-humidifier down the two parallel pipes into the blowing engine inside the brick building. The dark pipes visible over the de-humidifier building take the blast air to the stoves.





VARIETY of pipe bends made by the use of a bismuth-lead-tin-cadmium alloy melting at 158 deg. to 160 deg. F. Photo from Cerro de Pasco Copper Co., New York.

Bismuth

By ADOLPH BREGMAN
Consulting Engineer, New York

SEVENTH of a series of articles dealing with "The Right Metal in the Right Place", designed to aid manufacturers in selecting the most suitable non-ferrous metal or alloy for their products.

TO the metal products manufacturing industries, bismuth is one of the little known, and, in point of tonnage, little used, but extremely useful metals. Never used alone, it is nevertheless an almost indispensable "helper" wherever it is employed. And, from its record of the past few years, it is coming into the industrial spotlight at a very steady pace.

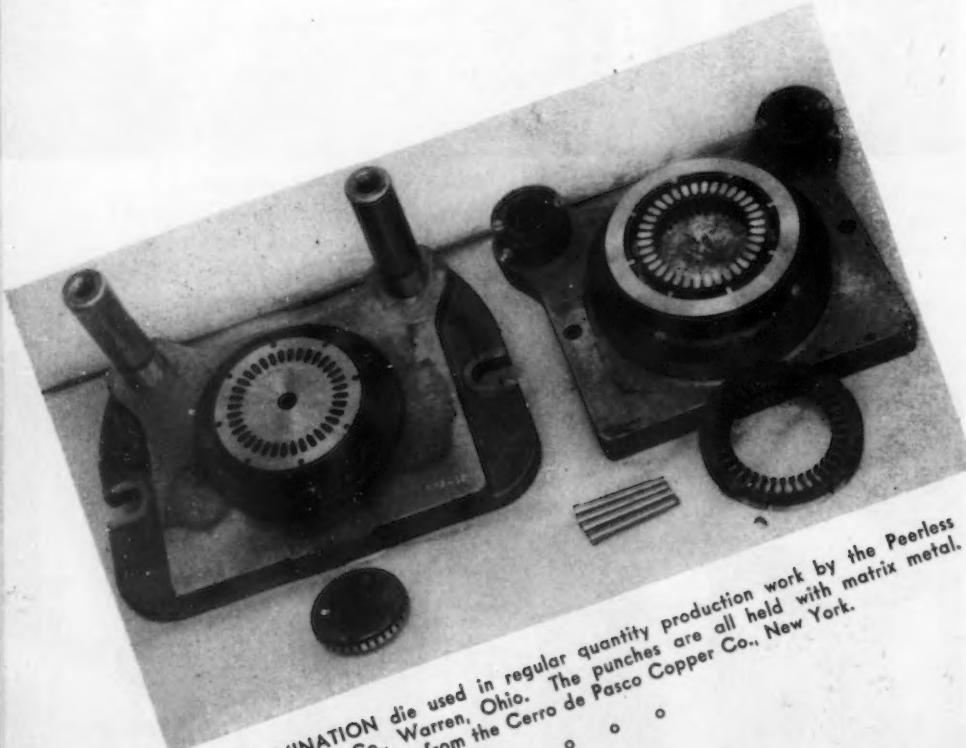
Known since the middle ages, it was produced in fairly pure form about the middle of the 18th century. Recovered today, almost entirely as a by-product in lead, tin or copper smelters and refineries, its total consumption in the United States is about 500 tons per year, of which about 70 per cent goes into pharmaceuticals. But the seemingly small balance has made a highly respectable place for itself from the standpoint of utility, based on some of its very unusual properties.

Bismuth is a high-purity metal, 99.99 per cent. It resembles lead in

some respects, being a white metal of low strength, high specific gravity (9.80), and melting at a low temperature (about 520 deg. F.). Like lead, it absorbs X-rays. It is brittle, has the lowest heat conductivity of any metal except mercury and has a lower surface tension than tin, cadmium, lead or antimony. Bismuth is the most diamagnetic metal known. The resistance of a bismuth conductor increases when in the presence of a magnetic field. Its outstanding characteristic is that *in cooling, from the liquid to the solid state, it expands 3.32 per cent*. It is upon that property, together with its low melting point and the even lower melting points of the alloys of which it forms a part, that its important industrial uses rest.

Uses of Bismuth Metal

The primary use for bismuth as a metal is as a constituent of low melting alloys—the "fusible" metals, used so generally in fusible plugs for boilers, sprinkler systems and other safety devices for fire protection, etc., low melting solders, dental models and tempering baths for small tools and parts. These alloys contain generally, one or more of the following: lead (up to 59 per cent); tin (up to 50 per cent); cadmium (up to 40 per cent); mercury (occasionally up to 10 per cent); and antimony (in a special case, about 9 per cent). Bismuth may run as high as 60 per cent. Melting points range from 140 deg. to 358 deg. F.



LAMINATION die used in regular quantity production work by the Peerless Electric Co., Warren, Ohio. The punches are all held with matrix metal. Photo from the Cerro de Pasco Copper Co., New York.

for Fusible Alloys, Models and Matrix Work

The accompanying table gives a selected list of fusible alloys with their flow temperatures, freezing ranges, compositions and uses.

Generally, alloys with over 55 per cent bismuth expand while solidifying; between 50 and 55 per cent, the volume changes very little. For that reason the 55.5 bismuth, 44.5 lead alloy (melting point about 254 deg. F.) finds much use for pattern duplication, as master patterns in foundries, and for proof casting of forging dies. Other types of uses for this

alloy, based on its advantageous melting point, include liquid seals for furnaces (nitriding, malleablizing or bright annealing), solder for foils of tin, lead or zinc and solder for parts of lightning arresters.

An important mechanical use for bismuth alloys is in tube fillers for bending and forming work. As a substitute for sand, tar or rosin, an alloy of bismuth, lead, tin and cadmium which melts at about 158 deg. F. is poured into the tube, chilled in cold water, the bending operation per-

formed and the alloy melted out of the tube in a steam or boiling water bath. The metal can be used over and over again. Applications for this process are found in aluminum alloy and other thin-walled tubing, for aircraft construction, in sterling silver knife handles and in electric refrigerator tubes.

Castings of bismuth alloys with melting points from 175 deg. to 180 deg. F. are made of such objects as toys and models in molds of metal, damp paper pulp or clay, in plaster-

SELECTED LIST OF FUSIBLE ALLOYS

Yield ¹ (Flow)		Freezing Range, Deg. C ²		Composition, Per Cent					Remarks
Deg. F	Deg. C	(a)	(b)	Bismuth	Lead	Tin	Cadmium	Others	
1	117	47	47	42.34	22.86	11.00	8.46	15.34 (In)	Eutectic (Probable)
2	145	63	68	42.80	22.80	11.40	8.50	14.50 (Hg)	
3	149	65	69	45.10	24.00	12.00	9.10	9.80 (Hg)	
4	151	66	98	55.50	17.00	19.00	.....	10.50 (Hg)	
5	151	66	66	49.30	26.30	13.20	9.80	1.40 (Ga)	
6	153	67	106	35.60	49.10	.....	.....	15.30 (Hg)	
7	154	68	70	47.50	25.40	12.60	9.50	5.00 (Hg)	
8	158	70	70	50.00	27.00	13.00	10.00	.....
9	160	71	78	42.60	37.90	11.00	8.50	.....
10	162	72	78	50.00	34.50	9.30	6.20	.....
11	169	76	105	35.30	35.10	20.10	9.50	.....
12	171	77	89	45.30	17.90	24.50	12.30	.....
13	172	78	97	38.40	30.80	15.40	15.40	.....
14	197	91.5	91.5	51.60	40.20	.....	8.20	.....
15	203	95	96	52.50	32.00	15.50	.....	.....	Eutectic (Probable)
16	203	95	105	50.00	25.00	25.00	.....	.....	Eutectic (Probable)
17	203	95	133	95	46.12	19.66	34.22	.....	.....
18	212	100	109	57.20	17.80	25.00	.....	.....	JEWELERS' ALLOY
19	214	101	118	40.00	40.00	20.00	.....	.....	MALOTTE'S METAL
20	217	103	103	39.30	.....	33.20	27.50	.....
21	219	104	114	50.00	.....	25.00	25.00	.....	Eutectic (Probable)
22	223	106	138	103	40.70	.....	27.90	31.40	
23	226	108	119	96	36.50	36.50	27.00	.....
24	232	111	143	96	33.34	33.33	33.33	.....
25	234	112	115	104	54.40	43.60	1.00	1.00	
26	241	116	227	104	48.00	28.50	14.50	.....
27	246	119	120	117	55.00	44.00	1.00	.....	Eutectic (Probable)
28	255	124	124	55.50	44.50	.....	.....	.....
29	261	127	137	96	28.50	43.00	28.50	.....
30	268	131	158	124	53.59	42.41	.....	4.0 (Sb)	
31	275	135	135	134	58.00	.....	42.00	.....	Eutectic (Probable)
32	289	143	143	143	60.00	.....	40.00	.....	Eutectic (Probable)
33	302	150	163	140	16.00	36.00	48.00	.....
34	324	162	168	120	10.00	40.00	50.00	.....

¹ Yield Temperature—Lowest temperature at which the alloy is sufficiently plastic to flow under the stress of its own weight.

² Freezing Range—(a) Formation of crystals, (b) completely solidified.

List compiled from laboratory data of Walter C. Smith, metallurgist, Cerro de Pasco Copper Corp., New York.

of-paris, wood, and even in soap. Fusible cores can be cast, then electroplated to desired thicknesses and the cores melted out, leaving the electro-formed shells. This application is finding increasing use in the making of molds for plastics, rubber, etc. and seamless hollow objects.

A noteworthy advance in bismuth alloys is embodied in a recently developed mixture consisting of 48 bismuth, 28.5 lead, 14.5 tin and 9 antimony, which has been called matrix alloy, after its most important use. It has unusual tensile strength for a bismuth alloy, 13,000 lb. per sq. in., and a Brinell hardness of 19, and will withstand 5 to 5½ tons per sq. in. load continuously, without being deformed. Its leading function is as a matrix for the accurate location and setting of parts of complex punches and dies for forming and cutting operations. The parts are set in the desired places in the die and the metal poured around them. The metal holds the parts accurately in the correct places as it does not contract upon solidification. The pouring temperature is too low (300 deg to 450 deg. F.) to affect the temper of the die.

Other applications for matrix alloy include similar machine and stamping shop accessories, like chucks for holding irregular pieces during machining, short run forming dies and punches, forming blocks for dressing aluminum sheet to shape, etc. It has

also found use in masks for spray enameling.

The problem of providing a seal—oil, air and watertight—between dissimilar materials has been solved in a number of instances by high bismuth alloys. For example, glass and either copper or brass can be joined, using 58 bismuth, 42 lead with the addition of 6 parts of antimony, for operating temperatures above 194 deg. F.; for lower temperatures matrix alloy or a bismuth-lead-tin-cadmium alloy is recommended.

Because of its low tensile strength, fusible alloys are hard to draw into wire. They can, however, be extruded into wire in a variety of shapes, down to as fine as 0.015 in. in diameter, to fit special applications. Some fusible alloys can be rolled into foil from cast slabs, while others are rolled into foil from the extruded shapes. The wire is used for soldering, and the foil finds applications as washers in safety devices.

If up to 1 per cent bismuth is added to lead-tin solders, the flowing property is improved with very slight effect on the melting temperatures or strength of the solders. Fractional percentages of bismuth can also be used to advantage in type metals, particularly stereotype and linotype, to improve their casting properties.

Low-melting solders call for alloys with appreciable percentages of bismuth. They are easy to work, free

from porosity, moisture-proof and flow well. Considerable work is being done at this time on these solders and more will be heard about them in the future.

Bismuth finds employment in very small quantities in a variety of other applications, such as special astronomical temperature-measuring instruments, in ceramics and plastics. Sometimes bismuth is electroplated on other metals to give an imitation of old pewter and also to protect the basis metal against the fumes of muriatic acid. Powdered bismuth, with or without powdered lead is used for proofing rubber aprons and gloves against X-rays. In special brake linings the powdered bismuth and lead act as a lubricant, and prevent seizure. A little bismuth (0.1 or 0.2 per cent) added to cast iron increases the fluidity, helps to produce cleaner castings and improves the machineability. In some aluminum alloys, a little bismuth and lead is said to improve the free-cutting properties.

In the manufacture of metal products, bismuth should be considered wherever it is desirable to have very low melting points, where shrinkage on solidification is to be avoided, where easy working is necessary, for liquid seals, for solid seals between metals and glass and for special die setting and locating. In solders, bismuth has a place for special work, but this place may grow from a niche to a firm foothold in the future.

Self-Lubricating Properties Obtained By Graphite Impregnation

IMPREGNATING surfaces of metal parts subject to wear to provide long lasting self-lubricating properties is the latest development in the search for methods of reducing scuffing and abrasion, particularly during the breaking-in of mechanical products. The new technique basically consists of the creation of a granular coating on the surface of the part by chemical treatment and then dipping the part into a bath of Dag colloidal graphite suspended in oil.

The granular structure created by

the chemical treatment is quite porous, so that the colloidal graphite is absorbed by and forms a mechanical bond with the metal. According to Acheson Colloids Corp., Port Huron, Mich., a good deal of the success of the new treatment is due to the development of a new form of colloidal graphite in which the particles are less than one micron (40 millionths of an in.) in size.

With this method of treatment, any slight wear is said to uncover new

layers of metal and colloidal graphite. Another advantage claimed is that the surfaces are much more easily wetted and will hold a film of oil two to three times as thick as similar but untreated surfaces. The treatment also has a tendency to reduce oxidation.

The process is already being used in the automotive industry for facilitating run-in of such parts as piston rings, valve guides, pistons, torque ball studs, ring gears and pinions, rocker arm supports and other applications.



Boeing Stratoliner.

STEEL CASTINGS IN AIRCRAFT

HERE was a day, quite within the memory of our generation, when the prophecy of a modern transport airplane would have been pronounced fantastic. But even the more liberal and visionary engineers who would have accepted this idea as a possibility, must have rejected the thought that steel castings could form a vital part of such a structure. Yet, today both are realities. And just as Langley's flimsy "Airdrome" was but a feeble fluttering of what was later to arrive, so was its contemporary steel casting a mere adumbration of what in modern times emerges as an engineering method and an engineering material, possessing, besides a wide range of strength and ductile properties, a capacity to resist the severest application of wear, heat and corrosion.

The production of a casting involves more than just the making of a metal, or a metal alloy. In a sense the makers of steel castings undertake not alone the problem of creating an engineering material, but also that of a structural unit; the synthesis of material and ideal form.

* Chairman, Technical and Operating Executives Group, Pacific Northwest Sub-Division, Steel Founders' Society of America.

¹ U. S. Patent No. 2,034,136, issued March 17, 1936.

Gregg and Daniloff, "Alloys of Iron and Copper," pp. 179-184, published by McGraw-Hill, New York, 1934.

Finlayson, "Low Alloy Steel Castings," *Metals and Alloys*, Sept., 1937.

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With aircraft engineers demanding ever lighter construction, concurrent with higher speeds and greater loads, the business of producing materials acceptable in the field of aeronautics daily becomes more complicated.

Used in Boeing Transports

Despite this, steel castings are playing an important role in the building of aircraft, and it is our purpose to indicate in some detail the various parts so formed and employed in landing gear assemblies by the Boeing Aircraft Co. in the construction of giant transports of the most advanced design. The same landing gear is also used by this company in the building of certain types of military planes, but for obvious reasons we shall restrict our remarks to the Model 307 Stratoliners weighing some 45,000 lb., and designed for operational altitudes of 20,000 ft. and cruising speeds of 215 miles per hr.

Engineers who are yet diffident, or professionally skeptical toward the ability of steel castings to successfully compete under the most exacting stress requirements, both in kind and magnitude, may, it is hoped, resolve their

doubts through consideration of the disclosures in this article; and those foundrymen and metallurgists who have not yet essayed the making of steel castings for airplanes will perhaps find some interest in a brief description of the requisites.

The complete group of cast steel parts included in the landing gear assembly may be seen in Fig. 1, ready for machining. As pictured here in the rough, the weight of these members varies between 2 and 128 lb.; the landing gear attachment and landing gear knuckle, the two largest units, weigh 128 and 92 lb. respectively. Figs. 2 and 3 show the landing gear attachment and the knuckle partly machined. When completed, their finished weights, in the previous order, are 81 and 59.5 lb. This represents a material waste of some 36 to 46 per cent, which, although substantial, is not great compared to losses under former practice. Many of these parts used on Boeing's earlier models were machined at great expense from rough forgings, which, of course, could not be hollowed out with cores. For the same relative service, although representing an advanced design, they are, as indicated, now cast to approximate shape and completed with marked savings in raw material and machine labor. However, since considerable change in design, with a sharp increase in the size of airplanes, has attended

the adoption of castings, no direct weight comparisons may be brought between them and functionally related parts which were formerly forgings. But we recall one instance of a landing gear member which weighed, in the rough forging, 130 lb. When completed it had been reduced to 15 lb; nearly 90 per cent of its weight was lost in machine turnings.

The chemical and physical requirements for the material in these castings are not difficult to satisfy, being originally Federal Specification No. 57-64-1 entitled, "Steel Castings for Airplanes," which is innocent enough when considered only with regard to the composition and strength properties of the material. There is, however, quite some difference between the strength properties of cast steel, *per se*, and those of steel castings as discrete units. The latter, although made from first quality steel may nevertheless include discontinuities in the form of cracks or shrinks, rendering it not a casting in the sense of a continuous structure, but a precariously joined group of components with severe stress concentration at the connection points, and ready under the imposed stresses of service to collapse through fatigue or sudden release of strain energy.

Cr-Mn-Mo Type First Used

The chrome-manganese-molybdenum type was the first attempted, the analysis being approximately as follows: C, 0.40 per cent, Mn, 1.35 per cent, Cr, 0.90 per cent and Mo, 0.30 per cent. Unfortunately several tons of this composition were cast and rough finished before the Magnaflux disclosed a great many otherwise indetectable surface cracks which caused the rejection of the entire shipment. Although the cracks sometimes occurred on plane surfaces they were most prevalent in fillets, even in those which involved no change in cross-sectional thickness. Few of these cracks extended to any great depth and many could be removed by grinding with thin wheels so that they would not again appear upon retesting in the Magnaflux. A great number, however, occurred on surfaces not intended for machining and even those which were shallow enough to be ground out without impairment to the section thickness, frequently reappeared after heat treatment. Despite a thorough metallurgical study and a complete revision of the foundry procedure, the best castings producible fell far short of the consumer's expectation. An alternate composition was then tried using nickel to substitute for part of the

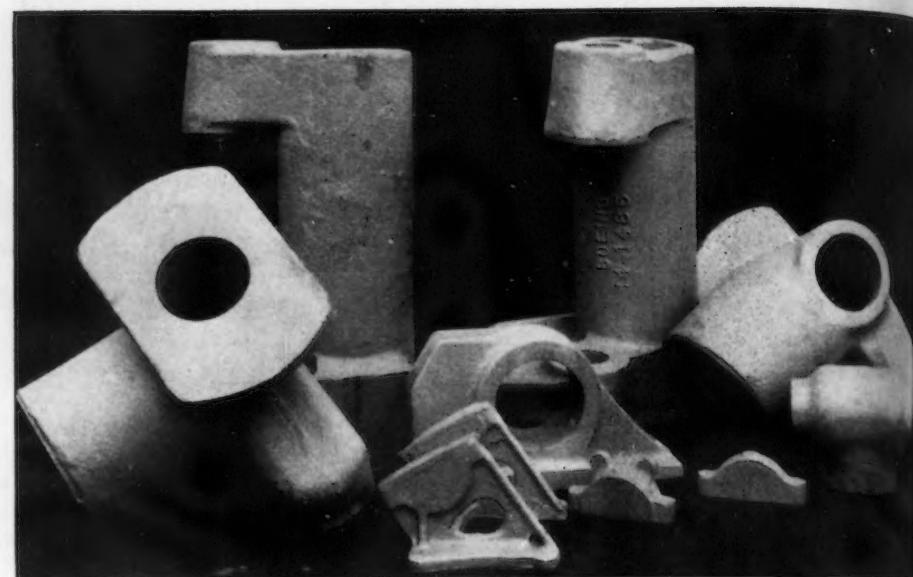


FIG. 1—Types of steel castings used in the construction of the landing gear assembly of the Boeing Model 307 Stratoliner.

manganese, the heats analyzing approximately C, 0.40; Mn, 0.70; Cr, 0.90; Ni, 1.40, and Mo, 0.30.

Although the designing engineers were in close rapport with the foundry operators, studying the amenabilities of each pattern to molding, pouring, gating and heading, conforming as fully as was practicable to the rules of symmetry, balanced section and contour, it was found almost impossible to cast these shapes in the specified analyses without constant recurrence of hot tears and cold cracking. Neither did these compositions develop satisfactory welding or quenching characteristics, heat checks and quenching cracks being extremely difficult to control.

The foregoing is not to be taken as a generalization that good castings may not be procured using the above analyses. What we state is that in our foundry, "airplane quality" castings, especially those of marked asymmetry and requiring heat treatment, have not been commercially nor consistently producible in these analyses after long and costly experimentation. The maximum yield from any pattern was about 20 per cent; with the landing gear attachment (Fig. 2) the yield was zero.

Cu-Si Alloy Developed

It is always an involved procedure to get even a minor alteration allowed in specifications after contracts have been let, but in the field of aeronautical engineering it is preeminently difficult. Nevertheless, approval was at length granted to manufacture these castings from a copper-silicon steel developed

in our foundry and described elsewhere in metallurgical literature¹. In pouring and molding practice the preference for this alloy is due to its marked fluidity even below average pouring temperatures. This characteristic facilitates the running of thin sections without cold shuts and promotes cleaner surfaces due to the reduced tendency of hotter metal to flux the mold facing.

This alloy may also be welded, when advised or required in assembly, without danger of cracking the surrounding parent metal. Moreover, this may be done either in the hardened or annealed condition. Quenching after welding may also be freely performed without hazard to the juncture. The composition in the present undertaking varies between the following limits: C, 0.12 to 0.20 per cent; Mn, 1.10 to 1.35 per cent; Si, 1.0 per cent to 1.25 per cent, and Cu, 1.50 to 2.0 per cent. Phosphorus and sulphur both run below 0.045 per cent.

Dry Sand Molds Used

Dry sand molding is used exclusively in the production of these castings, special precautions being taken to secure adequate venting and core relief. All molds are given a double wash with zirconium oxide and oven dried after each application, a treatment which, when carefully applied, results in greatly improved surfaces notably free from siliceous sinter. Close attention must be given to the method of application, the thickness of the coatings, drying, etc., otherwise a completely reversed condition will accrue. Little or no welding is permitted, due

no doubt, to the continued insertion in specifications for steel castings of the traditional taboo against the welding tool.

Perhaps this may be justified on the grounds of former abuses on the part of the steel casting manufacturers, but today it seems to present a little incongruity when much of the modern airplane is assembled by this method. Many highly stressed parts, such as struts and girders, are joined by arc

Heavi-Duty electric furnace equipped with automatic temperature and atmosphere control. Drawing is conducted in a Lindberg cyclone tempering furnace, also electrically heated and fully automatic. When heat treatment is complete the parts are again sand blasted and reexamined for any cracks which may have developed in quenching.

In the comparatively short history of aircraft, its engineers have drawn to-

ward themselves the laudable reputation of being hypercritical in the selection and inspection of their materials. For in this industry the directing theme must ever be that such materials become the custodians, to a degree, over the safety of those who fly. Indeed, this vigilance and strict insistence upon quality by men peculiarly alert to the havoc which lies potentially in the minutest imperfection, has had a salutary influence in raising the standards of excellence for engineering materials in general. And nowhere are the eyes of Argus more sleepless than in the Boeing technical staff whose trained inspectors stand guard at every significant stage in the evolution of a member.

Castings Are Magnafluxed

As received by the Boeing Aircraft Co., the castings are ready for machining. However, no work of this nature may be commenced until they have been thoroughly blasted with steel shot and examined for cracks or other defects by Magnafluxing in all the significant directions, as shown in Fig. 5. At this point castings of very superior quality, as gauged by the usual commercial standards, are frequently rejected for some small defects which the average mechanic or engineer would not recognize. The general arrangement of the heat-treating department is illustrated in Fig. 4.

Such flaws are generally in the form of minute cracks which sand or shot blasting has obliterated and may now only be developed in the Magnaflux. If any which appear can be removed by grinding within the finished



AT LEFT
FIG. 2—One of the largest steel castings used in the landing gear assembly, the landing gear attachment, is shown in the photograph bored and faced. This member, which weighs 81 lb. fully machined, is visible in the photograph of the complete landing gear unit (Fig. 6).

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welding and put into service without any kind of thermal stress relief.

After annealing at 1725-1740 deg. F., the castings are cleaned and subjected to a scrutinous inspection. Minor defects are removed with files or small flexible shaft grinders. It is necessary at this stage to separate those which do not warrant further work. Good castings are transferred to the heat-treating department where they are heated for quenching in a pit type

FIG. 3—Another large steel casting employed in the Boeing landing gear unit is the landing gear knuckle illustrated here about half completed. This member weighs 59½ lb. fully machined.



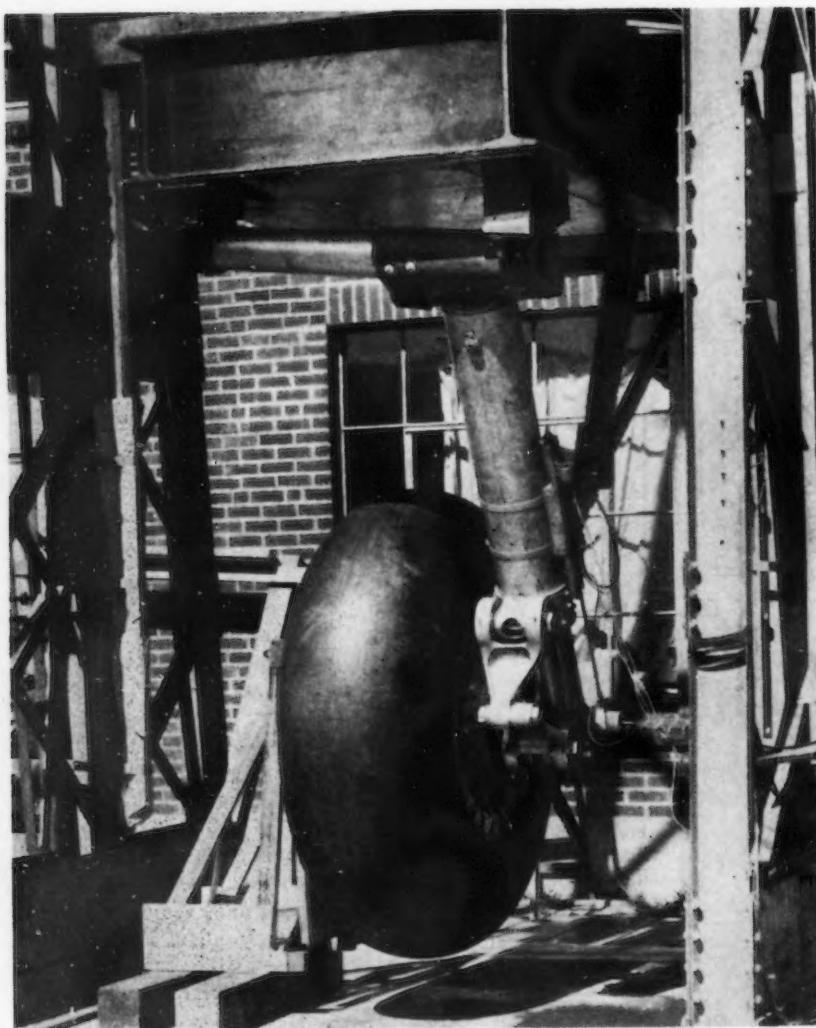


FIG. 6—Steel castings play an important role in providing safe and sturdy legs for Boeing's giant 33-passenger Stratoliner. In this photograph of the landing gear assembly of a Stratoliner, many of its cast steel components can be seen, notably the landing gear attachment, visible at the upper end of the shock absorber, and the knuckle, which projects from the wheel center.

dimensions, the casting is passed to the machine shop; but if on a surface showing no machine finish, where grinding would seriously reduce the section thickness or result in a region of local stress concentration, the part must be condemned.

Since the control of porosity and shrinkage cavities is an elementary art in the modern foundry, rejections from these causes are rare. It is quite seldom that a casting develops any visible defect during machining, and thus one might conclude that all fully machined units had passed to the inner circle of acceptance. But such is not the case, for there are yet some final tests.

Each part must now be pickled and cadmium plated, an operation which, although performed primarily to inhibit corrosion, serves innocently but efficiently as a discoverer of slag spots,

oxides, spongy areas and perhaps internal fissures exposed on machining. Cadmium cannot be deposited on flaws such as these, a small black spot or line remains uncoated, which, in the otherwise silvery field, stands out in tell-tale, often fatal contrast. If no defects of critical proportions develop at this point the castings are returned to the Magnaflux for a final examination which they must pass with honors. Those that do become at length an integral part of an airplane's landing gear.

It should be noted, however, that in addition to all this, many of the more important members, such as the landing gear knuckle (Fig. 3), are subject to X-ray examination to discover internal cavities or shrinks. Thus it may be concluded that the percentage of accepted castings, based upon the

number poured, falls far below the average commercial yield.

Dynamic Test Used

Dynamic testing of each new landing gear design in complete assembly is conducted by Boeing engineers on a specially constructed drop test rig. Although the principal purpose of the apparatus is to obtain data on the



FIG. 4—View shows the

performance of the oil shock absorber. It provides a convenient method of observing the behavior, under dynamic loading, not only of the entire unit but of its individual component members. The device is designed and adjusted to permit making the drop test at a definite angle with the ground, simulating as nearly as possible the mechanical reaction in the gear of a 45,000-lb. plane striking the landing field at 80 miles per hr. The test is performed four to six times on each new assembly and in this case required loading one half of the landing gear to approximately 22,000 lb. and dropping from a maximum height of 25 in.

Requirements Are High

Although we have been able to produce steel castings to pass the rigid inspection herein described, the accepted mean percentage, combining all patterns, would not be considered satisfactory in ordinary production. The

foundryman or metallurgist is not competent to know the stress requirements for materials in airplane construction and we do not propose that its demands are unnecessarily severe. Nevertheless, we should like to observe not only for the consideration of the foundry industry, but as a suggestion to specifying engineers, that in our opinion the Magnaflux is not a

fects of this order are not allowable, the designer should provide extra metal for machining them away. Or, if the casting is of such contour that this is impracticable and therefore must be used rough, that is, without cutting off the outer skin, adjustments must be made in the designing stress to compensate for these contingencies. A crack which the Magnaflux exposes

on a machined surface is of course another matter.

Yet, in conclusion it cannot be inappropriate to speak a word of counsel to the steel foundry industry at large. We have already indicated that the needs of aircraft have been the inspiration for marked refinements in the properties of engineering materials. We find this reflected in the phrase "airplane quality," which is now a standard term in the nomenclature of steel casting. This term will not diminish in its scope. It will expand.

If steel castings are to hold their place in a progressive engineering age they will require some sharp refinements. One of these, perhaps the most important because it is the most apparent, is indicated for the outside, for the surface.

Research has concerned itself commendably with cast steel. It has not, unfortunately, given much thought to the steel casting. It seems, therefore, that the industry stands most in need of a fundamental, scientific scrutiny into the art of casting some of its excellent alloys smoothly into predetermined shapes. Not just an empirical, trial and error, cookbook procedure of testing sand mixtures, bonds and binders, but a comprehensive investigation by men divested of traditional materials and methods, seeking a better way, perhaps not sand at all.



is the general arrangement of equipment in the heat treating department.

convincing test for determining the serviceability of a rough, unmachined casting. By this we mean that when defects are of a size and character that it requires the Magnaflux to make them evident, we believe that engineers are overreaching, and extending the limitations and expectancy of a rough steel casting. Otherwise steel castings could never have survived in the engineering field; they must rather have succumbed to their own deficiencies, without awaiting the advent of the Magnaflux to expose them as defective.

All castings, whether simple shapes like ingots poured in smooth iron molds, or complicated sections cast in sand, will exhibit varying degrees of surface irregularities, small cooling checks, sintered sand spots and some hot tears with rounded bottoms. If such were not so, much of the necessity for descaling slabs and forging billets would be obviated. When de-

FIG. 5—All steel castings used in the Boeing landing gear assembly are Magnafluxed to discover cracks and other defects. Illustrated here is the Magnafluxing of the landing gear attachment.

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FINISHING ROOM

FIFTH in a Series of Articles on the Economic Aspects of Metal Cleaning and Finishing

UNIFORMITY of product is important in successful production operations, and is necessary for repeat business. Control is the basis of uniformity of product, and extends even to uniformity of finish of the products.

Controlled finishing, with its accompanying improvement in the quality of the finish and economies in material and labor, is practical for smaller manufacturers as well as for the larger plants.

Control over the uniformity of finish of products embraces many factors, such as the type of product or surface being coated; the quality of the material; the spray equipment, its adaptability for the work, its condition and adjustment; and the man behind the spray gun.

Controlled finishing in an industrial finishing room includes material control of (a) viscosities, (b) mixing, and (c) delivery; control of fluid pressures; control of air supply and pressures; control of film thickness; control of spray equipment and repairs; control of exhaust, replacement air, temperature, and cleanliness in the finishing room.

Such control set-up for the larger industries pays for its upkeep many times over by economies effected, rejections minimized and satisfied customers. For small plants, because of the limited quantity and variety of material used, such a degree of control may not be so practicable, but even in small plants many of the control ideas are applicable and will be found advantageous.

Material control includes control of

viscosities, mixing and delivery of finishing material.

All mixing rooms are, or should be, equipped with a viscosity cup or some means of metering the viscosity of finishing materials to be supplied the spray operators for application. It is known that each material has a certain viscosity which is considered as the best point of flow. Possibly a temperature standard has also been recommended for best application of the material and for highest quality of finish.

If material is thinned too much its hiding capacity may be impaired. It may have a tendency to run or sag; consequently the best possible material control should be set up to hold materials at their proper viscosities, and to use the type and quantity of thinners recommended by their manufacturers. Frequently in the application of synthetic enamel, in case the proper thinner is not used, the finish will have a sandy appearance. Finishers will often say that the pigment was not properly ground, but the real facts are that if proper thinner had been used, all of the small particles would have dissolved.

The man in charge of mixing of materials should be instructed in the proper care and cleaning of his equipment, how necessary it is that all material be strained, why viscosities must be maintained, and, where he has several manufacturers' materials in use, how necessary it is that he use the thinner corresponding to the material being mixed.

Mixing and Delivery

Mixing room control should be such as to insure uninterrupted production

schedules, and to prevent shut-downs due to dirt in materials with consequent gun troubles, rough finishes resulting from improper viscosities, or other difficulties brought on by using wrong thinners, thus tending to produce excessive orange peel or improper drying and possibly causing a quick breakdown of the finish.

Control of the delivery of the material to the spray guns and operators cannot be passed over lightly, due to the cost of the material sprayed by each gun in the course of a day. For complete control of the delivery of material to the spray gun (where 30 gal. or more of one kind of material are used in a day), the paint circulating system reduces paint handling costs and increases output.

Delivery of clean, fresh, uniformly mixed materials through pipe lines to the spray guns makes for better working conditions. It eliminates the trucking of paint through the plant, prevents any mess around spray booths, makes possible a greater degree of plant cleanliness and reduces fire hazard. There are no containers to clutter up the booths or to be cleaned and refilled.

Each pipe line carries a different color or kind of material. The finishing material for the paint supply lines is put into mixing tanks in a central control mixing room and thoroughly mixed by a motor-driven agitator. It then is drawn from the tanks through the pumps, is strained and is circulated constantly from the mixing room direct to spray operators and returned to the mixing room. Regulated paint outlets are provided at the various spraying locations. Each fluid regulator is equipped with a fluid cock, and fluid hose to the spray gun is attached to the outlet.

The circulating system is a positive guard against the fluid flow being tampered with by spray operators. The fluid regulator key is retained by the foreman or gang leader, making it impossible for the operator to increase or decrease the flow of material to the

CONTROL

By L. W. LAMMIMAN

Service Engineer, DeVilbiss Co.

gun. With this arrangement, positive control of material delivery is constantly maintained. Any tendency of operators to interfere with the paint mixture by adding thinner to suit their convenience is eliminated. Dirt troubles are done away with, and "off color" is held to a minimum. When "off color" does occur, it generally can be traced directly to an operator who is slighting his work; consequently the cause can be quickly found and corrected.

Finishing material is delivered to spray guns at a uniform pressure, insuring even application in the proper thickness by each spray operator, thus lessening sanding and polishing.

Wherever paints or finishing materials are applied by hand spraying, the man behind the gun is an important factor. Spray operators may be compared in general to house painters, interior decorators and artists. Although all use the same materials and tools, each man may have certain abilities not found in others. Operators spray differently, and control is necessary for those who have the least ability.

A large manufacturer interested in the possibilities of controlled finishing decided to find out how nearly alike his operators sprayed insofar as material consumption was concerned. He installed a fluid flow meter at one position in his production line and checked each operator working at this position. Each man sprayed 50 of the same objects with no control on fluid passing to the spray gun. It was found that one operator sprayed one pint more of material on each of the 50 objects than any of the other operators. Fluid control was quickly adopted resulting in a considerable saving per unit.

Other savings are effected on the wear of spray gun parts. If the material is regulated to the spray gun in such a manner that the spray operator can leave his fluid adjustment wide open on the spray gun, allowing the fluid needle to be drawn back out of

the fluid tip opening, less wear occurs on the fluid tip and needle and longer life of these parts is assured. Then, too, with fluid control and with the spray gun fluid adjustment open, the pull of the fluid adjustment spring is taken off the trigger. Consequently, the operator triggers the gun more frequently, cutting off the spray and eliminating the waste of material at the end of each stroke of the gun.

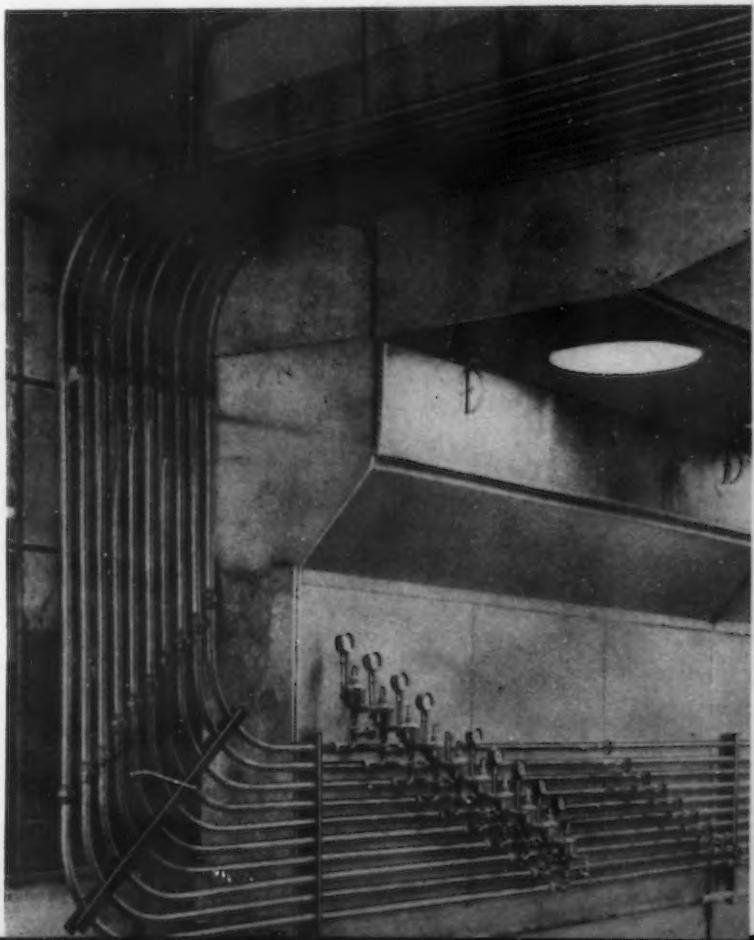
The size of fluid hose recommended for best control of material flow to the gun is a $3/8$ -in. I.D. x $11/16$ -in. O.D. spray-painting hose. This size permits sufficient material to be supplied to the spray gun, so that the hose is washed clean by the constant movement of material. This is desirable because some materials have a tendency to drop out of suspension. Hose of this size also is light and flexible, giving the operator better control of the spray gun.

Control of Air Supply

Control of the air supply and pressure is necessary. There are several methods and diverse opinions as to the preferred method and the most effective pressure to employ. Air is to a spray gun what gasoline is to an automobile engine. Both are necessary to create action.

However, it might be well to mention some facts which have a general bearing on air supply and pressure. In most large factories the air compressing equipment is located in a clean room and the intake air to the compressor is usually taken from outside the building. This air is compressed and discharged into a large air tank very closely connected to the compressor. The air is then piped to a large tank centrally located and known as an "after cooler." It is equipped with cold water coils or some other means to cool the air as it expands on enter-

WIDE bends in pipe lines and staggered fluid regulator arrangement of circulating system.





• • •
A SMALL four-line system. Advantages of the circulating system are not confined to large installations.

• • •

ter air hose was being used which was "starving" the spray gun, and this condition was reflected in the finish obtained. Although the air passages in spray guns have been enlarged from time to time to insure the proper volume of air reaching the air cap, this improvement is too frequently offset by the use of too small size air hose. After all, it is at the nozzle of the spray gun that the proper volume and pressure of air is required.

Air pressure drop is the difference between pressures at the point in air supply line at which the air hose is connected and the actual pressure gage reading at the spray gun. The amount of pressure drop which occurs in various lengths of $\frac{1}{4}$ and $\frac{5}{16}$ in. air

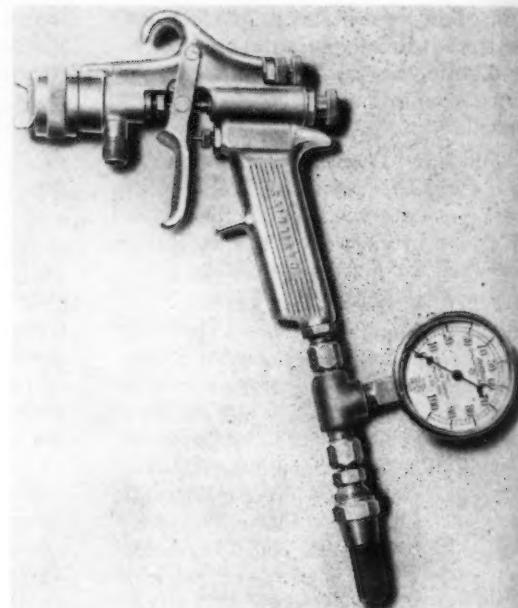
ing the tank. The air is then piped all over the plant to points wherever compressed air is needed. The size of the pipe depends on requirements in cubic feet of air necessary to operate all spraying equipment and other air tools. Air lines act in the same way as a storage tank and the larger the pipe the less the drop in pressure.

The air line usually consists of a galvanized iron pipe from the compressor storage tank to the transformer (the equipment by means of which the air is filtered of oil, moistures and other impurities and the pressure regulated), and a length of hose from the transformer to the spray gun. Both pipe and hose must be of sufficient size to restrict as little as possible the passage of air through them. The main air line should not be smaller than the outlet valve through which the air leaves the air storage tank. Pipe take-offs from the main air line to the transformer should never be smaller than $\frac{3}{8}$ in.

All air lines should have sufficient elevation so that all moisture collected in line will drain back to air tank, where it can be drained off. All branch pipes should be taken off at the top of line and then dropped down to the

• • •
AT RIGHT
A TEST gage for checking the pressure of the air at the inlet of the spray gun.

• • •



operator or machine where air is used.

Common sizes of spray gun air hose are $\frac{1}{4}$ in. and $\frac{5}{16}$ in. inside diameter. The larger the hose the less restriction there is in the volume and the smaller the drop in the pressure of the air. Large manufacturers have found that a $\frac{5}{16}$ in. I.D. x $\frac{5}{8}$ in. O.D. hose is best suited for production spraying. This size of hose is flexible and light, and the loss in air pressure between the air outlet and the spray gun is very small. The $\frac{1}{4}$ in. size air hose is not recommended with standard production spray guns and should never be used in this service in any length over 12 ft.

In analyzing many cases of so-called spray gun or material trouble, it has been found that a small diameter air hose was being used which was "starving" the spray gun, and this condition was reflected in the finish obtained. Although the air passages in spray guns have been enlarged from time to time to insure the proper volume of air reaching the air cap, this improvement is too frequently offset by the use of too small size air hose. After all, it is at the nozzle of the spray gun that the proper volume and pressure of air is required.

hose are shown in the accompanying table.

One investigation of what was considered to be spray gun or material trouble disclosed the fact that a small diameter air hose was being used. The operator swore that he was using 105 lb. air pressure (a much higher pressure than would be recommended for his material) yet this pressure was not sufficient to properly atomize the material. A test gage was attached to the air inlet on the gun and it was found at that point the air pressure was 48 lb. He was spending hours of labor sanding and rubbing the finish produced because of inadequate pressure. This was eliminated as soon as his small air hose was replaced with the proper size.

There are, of course, other causes for loss of volume and pressure in an air line. These include rusty pipe, leaky valves and connections in the air line, old hose and worn or loose fitting hose connections. But air hose of improper diameter and length may be a contributing cause by "starving" the spray gun and resulting in a faulty finish. Proper allowance for pressure drop should always be made.

Where there are several operators grouped on a production system, master regulation is recommended. A line should be run from the main air line to a header located immediately over the operators. The hook-up leading from the main air line should enter the header in a central location. The master regulator should be located in the line between the main air line and the header. The regulator must be large enough to pass sufficient air to the spray guns being used.

With a master regulator controlling the air, all operators have the same atomizing pressure, and products are sprayed with a uniform finish. This eliminates the tendency of individual spray operators to adjust air pressures to suit their own ideas. Control here prevents uniformly mixed materials from being sprayed with widely varying air pressures.

Where several operators are using air regulated by one master regulator all air hose should be of the same size and length. Each operator then has the same drop in air pressure between the air outlet and the spray gun.

It is good policy to install an air condenser at each air outlet, and, indeed, is necessary in some localities where a high water content is found in the air at all times of the year.

Film Thickness

With fluid and air pressures uniformly controlled and a uniform spraying technique employed, the finish should result in uniform thickness. A check of the film thickness as applied by different operators working haphazardly disclosed variances hardly believable. If 0.001 or 0.0015 in. film thickness is sufficient for beautification or protection, anything in excess merely increases the cost. Electrical instruments for measuring film thickness on metal surfaces are available. They should be a part of the equipment in every finishing control laboratory.

Spray Equipment

Control of spray equipment includes supervision of all spray guns, tanks, transformers, air and fluid hose, hose connections, and all repair parts needed for equipment upkeep. A cen-

tral control system for all spray equipment used in the various departments has been found to be the best plan. It is a fact that spray equipment is too often abused and neglected. Spray guns, tanks, transformers and hose are allowed to go uncleared for weeks. When such conditions are permitted to continue for even a short time, parts of the equipment are found to be in such condition that replacement is necessary. Parts are replaced that would have functioned satisfactorily if they had been properly cleaned and reassembled in the equipment. Precision tools are carefully handled and cared for. A spray gun belongs in that category.

In several plants where the central control system for spray equipment is used, inventories on repair parts have been reduced to one-fourth, and the cost of repairs to one-third of previous costs. Spray equipment requires care and good housekeeping. The central control system should be under the supervision of a man who understands this type of equipment. He should know something about the application of materials, and be capable enough to pass judgment on the equipment and know when it is working satisfactorily.

Exhaust System

Control of exhaust and replacement air are in effect automatic if the exhaust system was designed as a complete unit system for the most efficient removal of spray vapors from the finishing room.

To insure uniformity in the finished products, all elements of the exhaust system (such as the spray booth, fan or blower, piping, etc.) should be so designed as to function effectively as a complete unit system rather than merely as individual parts. One of the numerous requirements, for example, is that a proper velocity of air be provided at all points in the spray

booth regardless of the location of the outlet.

The spray booth in itself is just one element of the complete exhaust system. When engineered as a complete unit, designed to fit the individual requirements of the particular plant in which it is located, an exhaust system insures cleaner work, improved and safe working conditions and lower insurance rates. Among the many factors taken into consideration when a spray booth is built into an exhaust system, are the location and size of air intakes to furnish a proper percentage of fresh air to replace the exhausted air, tempering of fresh air, etc. These factors of efficiency when built into a properly designed complete unit system, minimize the degree of control necessary in exhaust, replacement air, temperature, and cleanliness in the finishing room.

With the trend toward the application of finishes becoming more of an exact science and less rule-of-thumb, and with the supervision of finishing in the hands of technically trained men, more and more progressive plants are increasing the efficiency of their finishing rooms through the use of control methods.

It is to the interest of executives in industries whose products are spray-finished, to consider the advantages of control methods, and to see that spray gun operators are carefully selected, properly instructed, adequately safeguarded and supplied with the best of spray and exhaust equipment to do good work easily and economically. Any manufacturing plant in which key men do not fully understand spray equipment and its control, should have its men trained in this work. One of the large spray equipment manufacturers conducts a school in which these methods are taught, and has proved very helpful to those who need such assistance.

DROP IN AIR PRESSURE

(To be expected from various lengths of $\frac{1}{4}$ -in. and $\frac{5}{16}$ -in. air hose when used with spray gun equipped with air cap consuming approximately 12 cu. ft. of air per min. at 60 lb. pressure.)

$\frac{1}{4}$ in. I.D. Air Hose (Pressure in Lb.)	Air Pressure Drop at Spray Gun					
	5-ft. Length Lb.	10-ft. Length Lb.	15-ft. Length Lb.	20-ft. Length Lb.	25-ft. Length Lb.	50-ft. Length Lb.
40	6	8	9 $\frac{1}{2}$	11	12 $\frac{1}{2}$	24
50	7 $\frac{1}{2}$	10	12	14	16	28
60	9	12 $\frac{1}{2}$	14 $\frac{1}{2}$	16 $\frac{1}{2}$	19	31
70	10 $\frac{1}{2}$	14 $\frac{1}{2}$	17	19 $\frac{1}{2}$	22 $\frac{1}{2}$	34
80	12 $\frac{1}{2}$	16 $\frac{1}{2}$	19 $\frac{1}{2}$	22 $\frac{1}{2}$	25 $\frac{1}{2}$	37
90	14	18 $\frac{1}{2}$	22	25 $\frac{1}{2}$	29	39 $\frac{1}{2}$

$\frac{5}{16}$ in. I.D. Air Hose (Pressure in Lb.)	Air Pressure Drop at Spray Gun					
	5-ft. Length Lb.	10-ft. Length Lb.	15-ft. Length Lb.	20-ft. Length Lb.	25-ft. Length Lb.	50-ft. Length Lb.
40	2 $\frac{1}{4}$	2 $\frac{3}{4}$	3 $\frac{1}{4}$	3 $\frac{1}{2}$	4	8 $\frac{1}{2}$
50	3	3 $\frac{1}{2}$	4 $\frac{1}{2}$	4 $\frac{1}{2}$	5	10
60	3 $\frac{3}{4}$	4 $\frac{1}{2}$	5	5 $\frac{1}{2}$	6	11 $\frac{1}{2}$
70	4 $\frac{1}{2}$	5 $\frac{1}{2}$	6	6 $\frac{1}{2}$	7 $\frac{1}{2}$	13
80	5 $\frac{1}{2}$	6 $\frac{1}{2}$	7	8	8 $\frac{1}{2}$	14 $\frac{1}{2}$
90	6 $\frac{1}{2}$	7 $\frac{1}{2}$	8 $\frac{1}{2}$	9 $\frac{1}{2}$	10 $\frac{1}{2}$	16

CANADIAN IRON ORE

By LOUIS DOREMUS HUNTOON
Consulting Engineer, New York

AN important buyer of United States ore, Canada may soon achieve self sufficiency. The situation in coal, however, is not nearly so promising.

IN 1924 the writer forecast the future of Canada as an important gold producer.

Today the writer makes the forecast that Canada will shortly become an important producer of high grade hematite, and will become independent of further imports from the United States and perhaps may even become an exporter to the United States.*

To encourage the mining of iron ore the Province of Ontario has granted a ten-year bounty of 2c. per unit of iron in iron ore mined in the Province and of such grade as to be suitable for smelting. As a reflection of this encouragement, the Magpie mine located northerly from Sault Ste. Marie plans production this year. Even more significant, however, is a new discovery of high grade hematite, 135 miles west of Port Arthur, which has been proved by drilling and should start production by 1941. The average

*The large Newfoundland mines are, of course, not technically in Canada. When Newfoundland ore is shipped to the Dominion it represents imports into Canada. Much of the difference between total imports of ore and imports from the United States (in Table I) represents Newfoundland ore.—Ed.

grade of this ore is expected to be 58 per cent natural iron.

Effect on United States

Reviewing the Annual Reports of the Dominion, it is found that there has been no iron mined since 1923 to date and that approximately 9,000,000 tons has been imported from the Mesabi and Lake region of the United States. These imports approximate 65 per cent of the total iron ore imports into Canada. In 1925 the imports from the United States amounted to 685,990 tons. A maximum of 1,565,042 tons was imported from the United States in 1929, which amounted to 68.7 per cent of total imports. However, the depression resulted in a rapid decline in imports.

From the import figures of Table I, it may be seen that the iron and steel industry of Canada has developed rapidly. And now that its own ore supply appears promising, and demands of the mines and manufacturing industries are growing, the future of Canada in a basic industry, iron and its products, is most attractive. Also, it is most likely that imports of finished steel from the United States and other countries will be curtailed.

Location of Iron Industry

Coal and coke are essential for the reduction of iron ore. The coal deposits of Canada are located in Nova Scotia and the western territories. The long freight haul from the west with no returning freight and no water

transportation from Nova Scotia during the winter months is one factor which caused the industry to locate in Ontario convenient to a supply from the United States. Approximately 50 per cent of the total coal consumed in Canada comes from the United States, and practically all of the coal consumed between Montreal and Winnipeg is imported from the United States.

The second factor bearing on the Ontario location for the industry was its proximity to a supply of iron ore from the Mesabi and the Lake regions. Canada may likely become independent of the United States in imports of iron ore but will still have to import its coal and coke from the United States under present conditions and methods of reducing the iron ore.

Magpie Mine

Prior to 1923 the Helen Mine, located in the Michipicoten area, northerly from Sault Ste. Marie, is reported by the Government to have produced millions of tons of hematite. Also, it is reported that the Magpie Mine in the same district has been proved to contain millions of tons of siderite (carbonate of iron), assaying approximately 35 per cent iron. This ore has to be beneficiated by calcining, and tests indicate that the calcined product will assay 51 per cent iron. This ore carried a bounty of \$1.02 per ton. Since the granting of a bounty of 2c. per unit, active development and construction work has been carried on

since 1938. Present plans indicate that production of calcined iron ore will start during the summer of 1939. Reports which the writer considers reliable are that the company will mine 450,000 tons of ore annually, which after calcining will amount to 300,000 tons assaying about 51 per cent iron.

The Algoma Steel Corp. is now practically a complete unit in the iron and steel industry, and since the bonus on the iron ore was granted several millions have been expended by Algoma in enlarging and adding to its equipment. A tin plate mill with a capacity of 30,000 tons annually has recently been built to produce black sheets and tin plate, for which there is a large demand in the Dominion. The rail mill has a capacity of 300,000 gross tons. A plant is being installed to manufacture grinding balls for the mining industry, and the demand for this product is on the increase. Therefore, Algoma and other producers, such as Dosco, should within a few years be able to supply Dominion demand for iron and its products.

Steep Rock Discovery

One of the most important economic discoveries made within the past two years has been the hematite deposit at Steep Rock Lake, Ontario. The deposit is located at Atikotan, 135 miles west of Port Arthur, and within four or five miles of the Canadian National Railroad. A hydroelectric line passes the discovery about one mile north of the deposit, and the location is most favorable as regards hydro-electric power and transportation.

TABLE I
CANADIAN IRON ORE IMPORTS

Year	From All Countries, Tons	From the United Kingdom	From the United States, Tons	From U. S. Per Cent
1920	1,632,011	0	1,144,430	70
1921	1,950,291	0	1,305,512	67
1922	656,902	0	509,185	77
1923	1,044,999	88	701,493	67
1924	1,807,223	314	1,296,253	71
1925	911,586	0	685,990	75
1926	1,053,593	0	692,030	67
1927	1,445,504	0	984,173	68
1928	1,491,234	0	1,010,223	68
1929	2,272,130	0	1,565,042	69
1930	2,456,919	0	1,639,700	67
1931	1,428,790	0	868,972	61
1932	802,163	0	544,909	68
1933	66,514	0	58,396	88
1934	205,811	0	176,369	86
1935	1,060,843	33	686,857	65
1936	1,431,111	288	764,262	53
1937	1,325,195	0	751,182	57
1938	2,174,559	0	1,418,079	65

In 1897 Dr. C. B. Dawson, in the annual report of the Dominion, called attention to the possibility of there being a valuable deposit of iron ore at Steep Rock Lake. Following the publication of this report a large amount of money was expended in prospecting without success. Thus, the area received a "black-eye." Scattered over the surface of the south side of the lake were boulders and masses of high grade hematite but none on the north side. At that time apparently no one considered the possibility of there being a deposit below the lake bottom. Later, Cobalt silver deposits

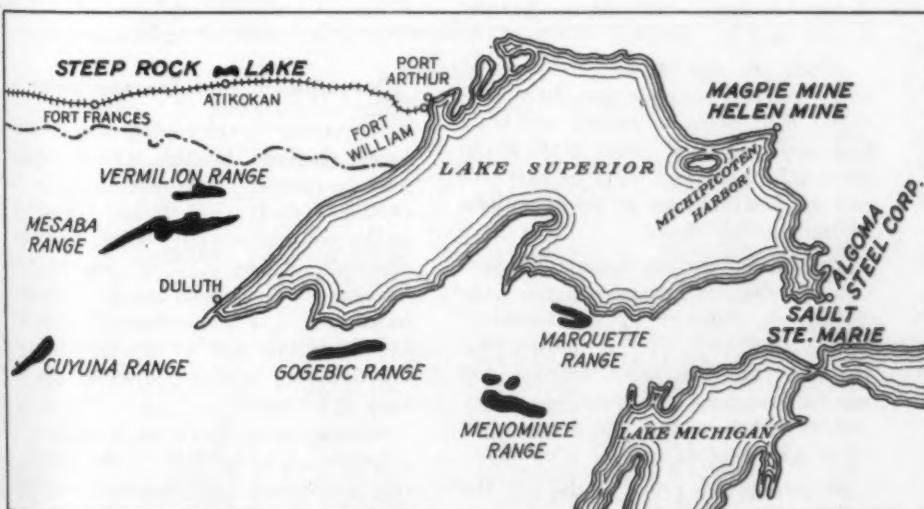
were developed, as were also the gold deposits at Porcupine and Kirkland Lake, where the deposits were found below the lake bottoms (Lake Shore being a striking example); also, the strike or trend of the long axis of the lakes such as the Dome, Wright Hargreaves, Teck Hughes and other important mines became better known. All this was likely an incentive to explore the bottom of Steep Rock Lake.

In 1930 J. G. Cross, an experienced and scientific prospector, often visited the area, probably studying Dawson's report of 1897. Finding massive boulders of high grade hematite on the south shore and none on the north shore, he decided that the ore must be below the lake bottom. Preliminary magnetic surveys were favorable, but he could not interest capital to explore. Therefore, he left the area to prospect elsewhere.

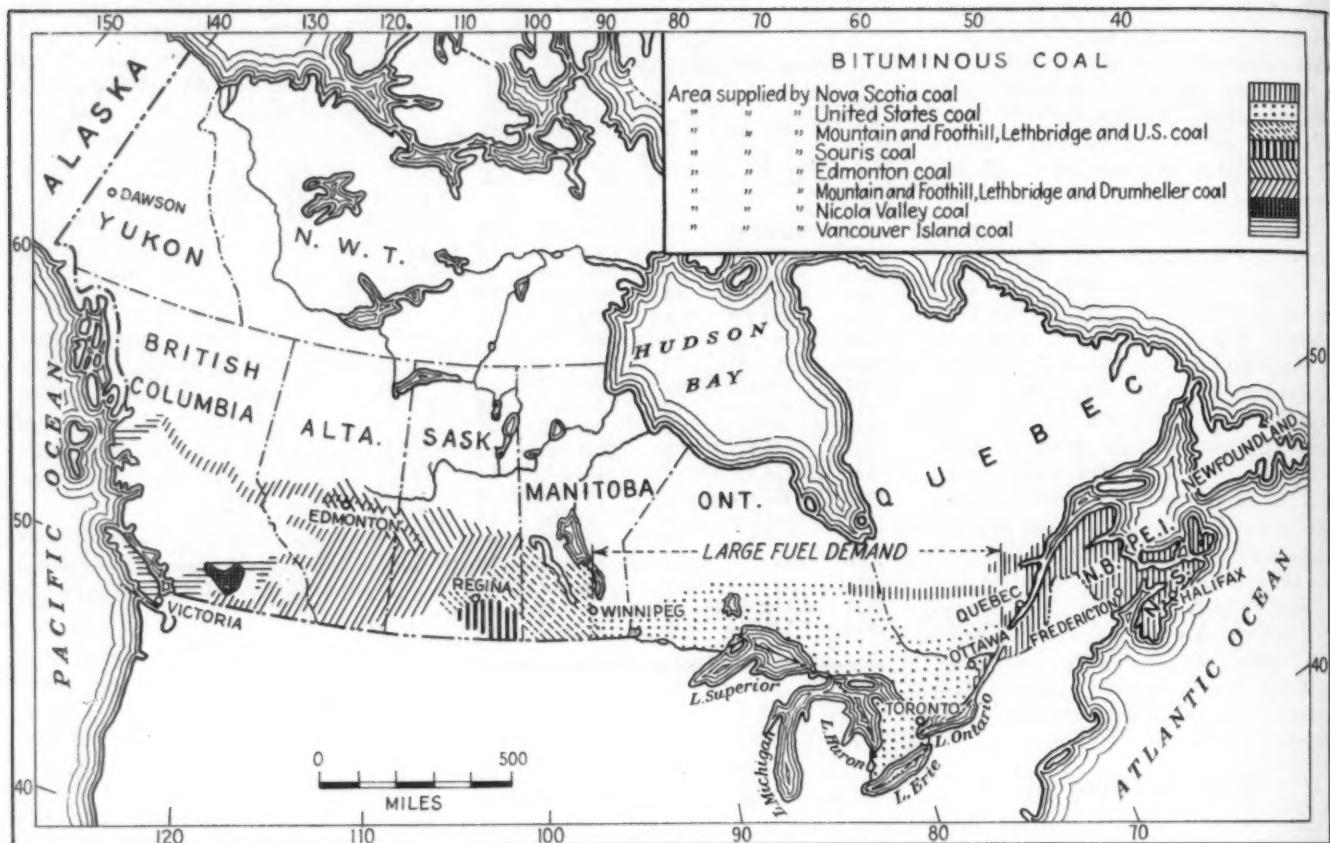
The financing of the Algoma Steel Corp. to develop its low grade siderite (35 per cent iron) and the granting of a bounty of 2c. per unit of iron content of commercial ore may have influenced Cross to return to Steep Rock Lake in 1937. After making a magnetic survey from the ice covered lake he again approached capital and ultimately interested Joseph Errington, who has been most prominent in developing new mining areas. Although hematite is non-magnetic the enclosing wall rock on the north side is magnetic.

The original money involved consisted of \$1200 advanced by Cross and a like amount of money and a diamond drill supplied by Errington. Diamond drilling was done from the ice covered lake during the winter of 1937-1938. Further money was required, and it was advanced by Errington. The first five holes did not locate the ore body but the sixth hole fortunately entered the ore body. Although this information was made public immediately, the district had such a black-eye that it attracted no outside attention. This gave the interested parties an opportunity to stake or acquire a large area for a distance of 15 miles. The first hole in the ore body gave no clue as to the strike or direction, which necessitated acquiring a large area for protection.

Dr. A. Brant, of the physics department of Toronto University, was called in during the winter of 1938-1939 to make a geophysical survey of the area



LOCATION of the Steep Rock hematite development. About 135 miles west of Port Arthur, four miles north of Atikotan, Steep Rock iron discoveries are shown in relation to the great iron ranges of the Lake Superior country. Note the availability of cheap lake haulage.



ORIGIN of coal supply in the Dominion of Canada. Area of maximum demand for coal is in the region north of the Great Lakes.

and an electrical resistivity survey. The results obtained were most enlightening.

During 1937-1938 a large number of holes were drilled from the ice to outline the ore body and obtain information as to its width. Many more holes were drilled during the winter of 1938-1939. Reports indicate that more than 170 holes have been drilled and that many more will be required.

The ore is exceptionally hard, necessitating the use of high grade carbons (diamonds) and specially made hard steel alloy bits to retain the carbons.

Ore Reserves

The Steep Rock deposit has not as yet been developed and any estimates on possible and prospective ore must be based on results obtained from diamond drilling. Quoting from an official letter received by the writer:

"We have about 50 vertical holes in an area in places 300 ft. wide and this one deposit has a length of 4000 ft. . . we have drill holes cross-cutting it at a depth from 400 to 1500 ft. vertical . . . we are not in a position to give out anything in a definite way

regarding tons . . . possible average width 150 ft."

One engineer after examining the core and correlating the drill holes estimated 100,000,000 tons of high grade hematite above the 1000-ft. level. The deposit has been proved to a depth of 1500 ft., and geological conditions indicate that much greater depths may be expected.

Based on dip needle, geophysical and electrical surveys and three diamond drill holes, a second ore body has been indicated about 6000 ft. to the south. Sufficient work on this second ore body has not as yet been done to estimate its extent.

Dr. Barkley of the Geological Survey of Ontario examined the area during the summer of 1938 and reported that he is of the opinion that the origin of the ore is igneous and not sedimentary and there is every reason to believe that the deposit will go to great depth.

Regarding the grade of the ore, the official letter referred to previously may again be quoted: "Our average analysis is around 58 per cent natural iron, very low in sulphur and phosphorus."

As a comparison, many of the Lake

Superior ores require beneficiation, and shipments during 1938 are reported to have averaged 51.53 per cent. Algoma Steel after beneficiation expects to obtain a product averaging 51 per cent. The average shipments from the Wabana Mine in Newfoundland during 1937 are reported to have been 51.72 per cent iron, 11.58 silica and 0.92 phosphorus.

Development and Transportation

Regarding development, the official letter received by the writer again may be quoted: "Our present plan is to sink a shaft 1500 ft. and cross-cut to the sections we have intersected by diamond drilling . . . at present we have no concern about caving or water hazards . . . it is needless for me to explain to you that we are mining under the lakes in many different places here in Ontario."

Arrangements have been made for a spur track to be built to the lake so that machinery and supplies can immediately be shipped to the property by water transportation. The sinking of the shaft is to start immediately.

Later, the Canadian National Railway plans to build a branch line to the mine, a distance of about 5 to 7

miles. The rail haulage to Port Arthur on the north shore of Lake Superior will be about 135 miles, where ore docks can be erected on the Canadian side and advantage taken of water transportation to the east. Sault Ste. Marie, which is convenient to the Algoma Steel Co., is at the eastern end of Lake Superior.

Canadian Ore Areas

In reviewing back volumes of the Canadian Year Books, one finds the occurrence of iron ore in many places throughout the Dominion which are of no economic value at present, other than the two discussed above. The sands of the St. Lawrence River contain more or less titaniferous magnetite, but attempts to recover this iron and treat it have not been successful. In southern Ontario there are lenticular deposits of titaniferous magnetite. However, no metallurgical process, so far as the writer knows, has been developed to separate the titanium from the magnetite. Petrographic analyses of such ores have been made for the writer, which show most of the titanium occurring as microscopic films which could not be separated from the magnetite by magnetic separation. In northern Quebec, east of Hudson Bay, there are deposits of iron ore, and if the writer recollects correctly these were examined years ago and found to be comparatively low grade; but regardless of grade they are at present inaccessible. The writer's attention has been called many times to the iron ore deposits on Belcher Islands in Hudson Bay but these also are inaccessible.

Reports of an extensive deposit of

hematite located in Labrador have been issued, and exploratory work has been in progress for some time past and will be continued. This deposit is so located that the ores can be shipped to Europe or possibly a steel plant erected nearby. There is excellent water power which could be developed near the property.

Ore Bounty

To stimulate the production and smelting of iron oxide ores in Quebec, the province proposes to pay a bounty of 2c. per unit of metallic iron contained in the ore for a period of five years, provided that such ore is smelted in the province.

The only property at present to benefit is the Aldermac Mine in western Quebec. This ore contains copper, pyrite, and some gold. By flotation the pyrite (iron sulphide) is separated from the copper. This pyrite concentrate is then treated so that the iron is recovered as a high grade oxide of iron suitable for smelting and the sulphur is recovered as elemental sulphur or brimstone for which there is a market. In 1936-1937 a pilot mill for the recovery of elemental sulphur was operated successfully at Niagara Falls. The sulphur unit which is being constructed at the mine is reported to have a capacity of 100 tons of elemental sulphur per day, for which sale contracts have been signed.

Coal and Coke

Although Canada is well supplied with cheap hydro-electric power, coal and coke are still necessary in the iron industry.

The coal mines of the Dominion

are located in Nova Scotia and the far west. Freight and climatic conditions are such that approximately 50 per cent of all coal consumed is imported from the United States, as shown in Table II. Approximately 100 per cent of all coal consumed between Montreal and Winnipeg is imported from the United States for domestic purposes, for fueling the railroads north of Lake Superior and for the iron industry in Ontario, where there is a heavy demand for iron and its products. The Algoma Steel Co. owns its own supply of coal in West Virginia.

Table II, listing the Canadian imports of coal, primarily for Central Canada, shows very high percentages from the United States. Therefore, with the further development of the iron industry in Central Canada the imports of coal will probably increase.

Ford to Erect New Car Delivery Building

DETROIT—A half million dollar new-car delivery building for Ford Motor Co. is to be erected at the Rouge plant immediately for occupancy in the fall. The structure will replace a smaller building for handling distribution to Mid-West dealers. It will provide additional space for the production of the three assembly lines at the Rouge including the new Mercury 8.

The building will be 680 ft. x 300 ft., of one-story steel construction with brick facing. Seven hundred forty tons of steel will be supplied by Whitehead & Kales Co., River Rouge, Mich. Storage space will be available in the building for 500 cars.

Included in the new building will be final inspection facilities and adjoining it will be a test road. One section for the installation of radios, heaters and other accessories will be provided. Two railroad tracks under roof for shipping new cars are also included in the plans.

Second Lot of 5000 Engines Ordered for Crosley Cars

An order for 5000 engines for the new Crosley automobile, manufactured by the Crosley Corp., Cincinnati, has been received by Waukesha Motors Co., Waukesha, Wis. The recent booking was the second received by the firm from Crosley.

TABLE II
CANADIAN IMPORTS OF COAL AND LIGNITE

Year	Anthracite	Bituminous	Total all Countries	From the United States	
				Tons	Per Cent
1920	4,982,313	13,861,229	18,843,542	18,752,981	99
1921	4,553,820	13,748,242	18,302,062	18,300,081	99
1922	2,705,752	10,317,772	13,023,525	12,255,555	94
1923	5,165,382	15,822,240	20,989,953	20,417,239	97
1924	4,152,558	12,546,214	16,724,779	16,405,314	98
1925	3,782,557	12,548,460	16,349,670	15,744,957	96
1926	4,192,414	12,376,606	16,570,448	16,204,405	98
1927	4,107,854	14,568,671	18,687,354	17,266,434	92
1928	3,748,816	13,445,945	17,205,541	15,830,688	92
1929	4,019,917	14,170,138	18,204,163	16,780,452	92
1930	4,256,090	14,497,955	18,772,721	16,971,933	90
1931	3,162,317	9,952,280	13,121,007	11,703,798	89
1932	3,148,902	8,807,131	11,959,037	9,889,866	82
1933	3,015,571	8,185,759	11,204,037	8,865,935	79
1934	3,500,563	9,471,605	12,974,959	10,580,710	81
1935	3,442,835	8,630,686	12,078,767	9,612,518	80
1936	3,418,556	9,343,301	13,123,431	11,204,234	85
1937	3,488,278	10,829,861	14,670,599	12,970,117	88
1938	3,475,801	9,131,267	13,012,491	11,273,531	87

THIS WEEK

ON THE

ASSEMBLY LINE

By W. F. SHERMAN
Detroit Editor

... *Packard in advance of industry in production of 1940 model cars . . . Production to stage sharp decline starting this week from 61,610 unit post-holiday output . . . New unit headlamps to make appearance on 1940 cars . . . Low-priced alloys taking precedence in auto industry.*

DETROIT—Packard takes the limelight this week as the first of the automobile companies to swing into production on the new 1940 models. The company has announced that more than 13,000 men will be at work in its plants in Detroit by Aug. 1 ready to produce a record volume of cars. Already more than 9500 employees have been returned to the payroll, according to M. M. Gilman, who thus begins his first model year as president of the organization.

A year of unusual promise for Packard is seen in the fact that it is entering the field first of all manufacturers with 1940 models and can boast of being in an unusual trading position because used car inventories are at the lowest point since Packard entered the lower priced field.

Deliveries of new cars will begin

during the first half of August, according to Mr. Gilman. Packard dealers will by that time have stocks of 1939 models and used cars practically at the zero point. Field stocks of new cars are now at the 3000 level and Packard is taking steps to liquidate all remaining stocks. "We . . . expect to be in the almost unique position of introducing new models at a time when dealers will have nothing but 1940 cars to sell," Mr. Gilman declared.

Prices have not yet been announced for the 1940 cars but Mr. Gilman indicated that further price reductions might result from economies anticipated from the program of plant rearrangement and unification recently completed.

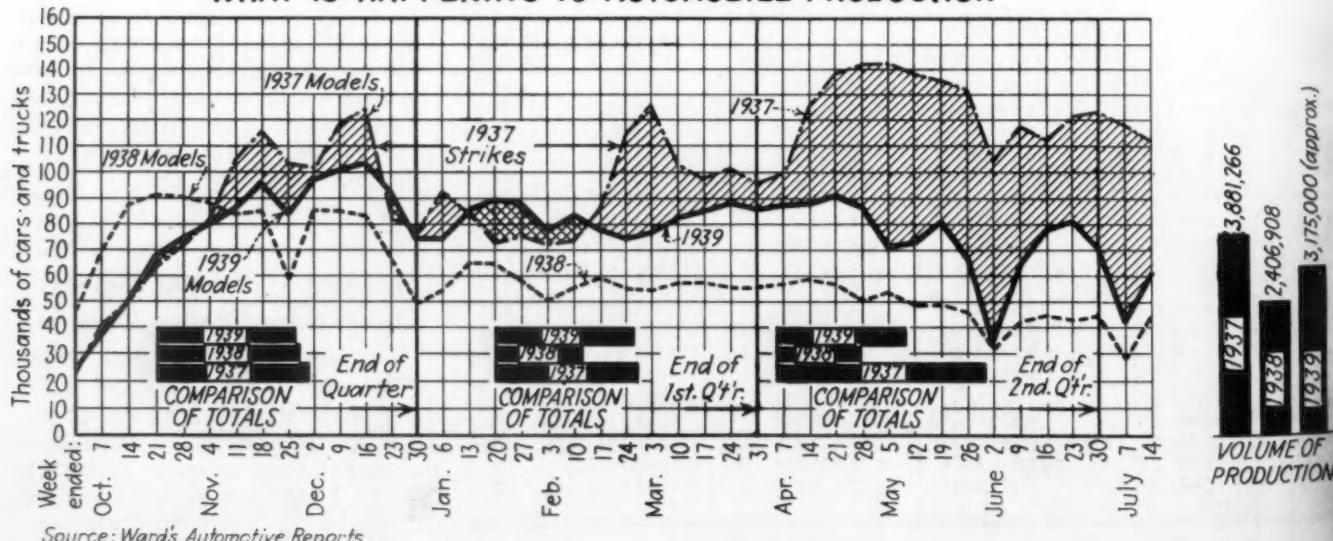
Besides this, the industry as a whole is looking forward to seeing, for the first time, Packard's new lighter car—

lighter than those that have been in the line for the past year. This car is expected to contain a lot of innovations in design and manufacturing practice. Many believe that it will be in the same pattern as the Studebaker Champion. It will be recalled that both manufacturers were working on new light cars at the same time. Packard was prevented from announcing its car last spring at the same time, or earlier, than the Studebaker announcement. However, the new Packard should make its appearance in August with the rest of the Packard line.

Assemblies to Decline

With Packard first to produce 1940 cars, the rest of the industry saw many of its plants entirely closed as far as automobile assemblies were concerned. However, 61,610 cars were assembled during the past week, compared with only 42,784 the week before and 44,510 a year ago, according to Ward's Automotive Reports. The strength of the Big Three was again demonstrated when Ford produced 18,000 Fords and Mercurys, compared with 10,500 the previous week, and 500 Lincoln Zephyrs compared with 300 the week before; Chevrolet turned

WHAT IS HAPPENING TO AUTOMOBILE PRODUCTION



Source: Ward's Automotive Reports



THE DESIGNER



THE ENGINEER



THE P. A.



THE CUSTOMER

"It's my job to save space
..keep down weight"

"I've got to make it work!"

"It's up to me to find the
best source of supply"

"I've got to use it ..
will it satisfy?"

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DIVISION OF ASSOCIATED SPRING CORPORATION
B R I S T O L, C O N N E C T I C U T



SPRINGMAKERS FOR MORE THAN THREE QUARTERS OF A CENTURY

out 17,500 units compared with 13,200 the week before, and Plymouth built 9000 complete cars, compared with 6950.

Production was better than seasonal and staged a very substantial rebound from the low level which prevailed during the week of the Fourth of July holiday. However, the current week will see the beginning of a precipitate drop in production. It is estimated by Ward's Reports that the total volume will drop 7000 or 8000 units.

The accompanying chart, "What is Happening to Automobile Production," tells almost the entire story of 1939 production compared with 1938 and 1937. At the beginning of the season and the end of the season there is necessarily a little overlapping during periods when some plants are producing old models and others producing new models, but except for this "fringe condition," the whole story is told by the chart and the three black columns alongside it.

New Design for Headlamps

A distinct departure in headlamp design for automobiles will become apparent in 1940 models. The two important producers each will offer unit

headlamps claimed to have great advantages over present types. In essence, each will attempt to provide a fixed reflector and filament which will greatly reduce possibility of "out-of-adjustment" and poor lighting. General Electric will offer its product in the form of a new headlamp bulb approximately 7 in. in diameter. This type of headlamp will be used on part or all of the Ford line and by part or all of the Chrysler line. General Motors cars will use new lamps being introduced by the Guide lamp division. These, it is understood, will contain a conventional type bulb but will have lens and reflectors permanently sealed together with the bulb inside.

In either case it is believed that the headlamps will offer improved lighting, particularly as regards non-glare features, but the cost of replacement will be increased to something like \$1.25 or \$1.35.

Of particular interest this week, as Packard begins 1940 production, is the fact that the well known Packard front end will be retained in all the essentials of its appearance. On the new, highly streamlined Buick series "50" and "70" and tentatively known

as the Torpedo series, the radiator grille will offer unusual horizontal lines, rather than the vertical chromium bars previously used. Black and chromium horizontal bars will be seen on the 1940 design and the bars will be heavier looking than heretofore.

Lower Cost Alloys Being Used

Recently a survey of the uses of alloy steels in the automobile industry revealed that there has been a sharp decline in the use of the complex alloys, difficult to make and carrying chemical extras in price. In fact, some authorities predict that as far as passenger automobiles are concerned, the day is fast approaching when little or no high-priced alloys will be used.

The Chrysler Corp. in its use of Amola steel is an example. Research by C. Harold Wills, Chrysler metallurgist, in cooperation with the steel industry, has resulted in the production of simple low-alloy steels with physical characteristics equal to, or better than the physical characteristics of the higher priced alloys produced just a few years ago.

Amola steel, as the industry generally knows, is a molybdenum alloy with relatively high carbon content, strictly controlled. In fact, probably the secret to the success of Amola steel is the fact that its manufacture is very carefully specified and every phase is closely controlled. Not being a complex alloy, it takes only a nominal extra for chemistry—yet its success is tested by its general use on Chrysler products.

Amola is just one case at hand—but, of course, the most prominent. Other automobile concerns are constantly seeking low alloy steels to substitute for more complex alloys. In fact, this week one of the most prominent companies in the industry took delivery of a heat of high carbon steel which it intends to test for spring steel. In the past, silico-manganese spring steel has been quite general for this company and others on similar applications. Difficulties in manufacture and higher price are given as the reasons for seeking a change.

Quality of the automobile quite apparently has not suffered. This in itself is quite a tribute to the steel industry which is able to supply the customer with steel to meet practically any requirements without being forced to ask prohibitive price extras. In other words, over the course of a comparatively few years, the steel industry has improved the quality of

(CONTINUED ON PAGE 80)

THE BULL OF THE WOODS

BY J. R. WILLIAMS





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CUNO ENGINEERING CORPORATION



MERIDEN, CONNECTICUT

THIS WEEK IN WASHINGTON

... Roosevelt's \$3,860,000,000 spend-lend program moving into final hearings in Senate ... Many toll bridges may be built, and railroad aid seems to be a definite prospect ... President asserts that many business men have been failures in Government service ... Ships and airplanes bulk largest in Government contracts of past three years.

By L. W. MOFFETT
The Iron Age

WASHINGTON — President Roosevelt's proposed new \$3,860,000,000 spend-lend program moved into the hearing stage last week as members of the Senate Banking and Currency Committee heard testimony from key Government officials who will administer the program that the Barkley bill, embodying substantially all of the features except the foreign loan provision, proposed by the White House, will stimulate private industry and bring a higher standard of living to the country.

Following the appearance of John M. Carmody, newly-appointed Federal Works Administrator, Jesse H. Jones, former RFC chairman and recently named by the President to head the Federal Loan Agency, told the committee that if loans are "properly made" under the program it would be self-liquidating.

Jones, who never comes before a Congressional committee with a prepared statement, conceded he had not read the Barkley bill but readily agreed to answer any questions. Asked about section 17 of the bill which prescribes a yardstick for fixing the interest rate under which loans would be made, the former RFC chairman frankly admitted he didn't know what it meant and insisted that its inclusion in the bill was silly.

Other features of the bill, including the provision making available \$500,000,000 to the RFC for locomotives and other equipment to be leased to the railroads, were endorsed by Mr. Jones who also supported the proposal that railroads be permitted to borrow money from the RFC for the purpose of buying in their outstanding securities at a discount. Some carriers, he

told the committee, could reduce their fixed charges by 50 per cent if they had the funds to buy in their fixed-interest obligations at a discount.

Super Toll Roads Not Feasible

The possibility of building any substantial number of super toll roads under the White House proposal appeared remote if Congress follows the recommendation of the Public Roads Administration, formerly the Bureau of Public Roads. The biggest bite of the program would be the \$750,000,000 proposed for toll roads and bridges but testimony given the committee by Administrator of Public Roads Thomas H. MacDonald showed that "a very small percentage" of the projects could be liquidated through tolls.

Described as "potentially self-liquidating," a list of 17 proposed bridges and tunnels planned for widely-scattered metropolitan sections of the country was given to the committee by Mr. MacDonald, who estimated they could be built at a cost of \$90,000,000. Although the witness said that only such portions of highways as would be self-liquidating have been turned in by his organization as part of the plan, he did not submit a list of these to the committee but there were indications that the road construction jobs he had in mind were by-passes, belt line routes and roads leading through the heart of metropolitan areas rather than cross-country highways.

Mr. MacDonald was mildly chided by Republican members of the committee during his testimony but he emphatically denied that there was anything incongruous about his recom-

mendations and the bureau's recent report which termed toll roads "traffic repelling." He explained that in order to make the toll road fully self-liquidating, there would have to be excess taking of land and a resale of some of these lands.

Chicago Has \$60,000,000 Plan

The City of Chicago is interested in building a \$60,000,000 road construction program to relieve traffic congestion, according to Mr. MacDonald's testimony. He told the committee that Mayor Kelley had talked with him about the project and that the city apparently was anxious to go ahead with plans if arrangements can be made under the new self-liquidating spend-lend program. As explained by the witness, land costs for the project would run in the neighborhood of \$45,000,000 and the plan would be for the Federal Government to buy the land, in accordance with the provisions of the bill, and the city would pay about 4.8 per cent per year until the debt was amortized.

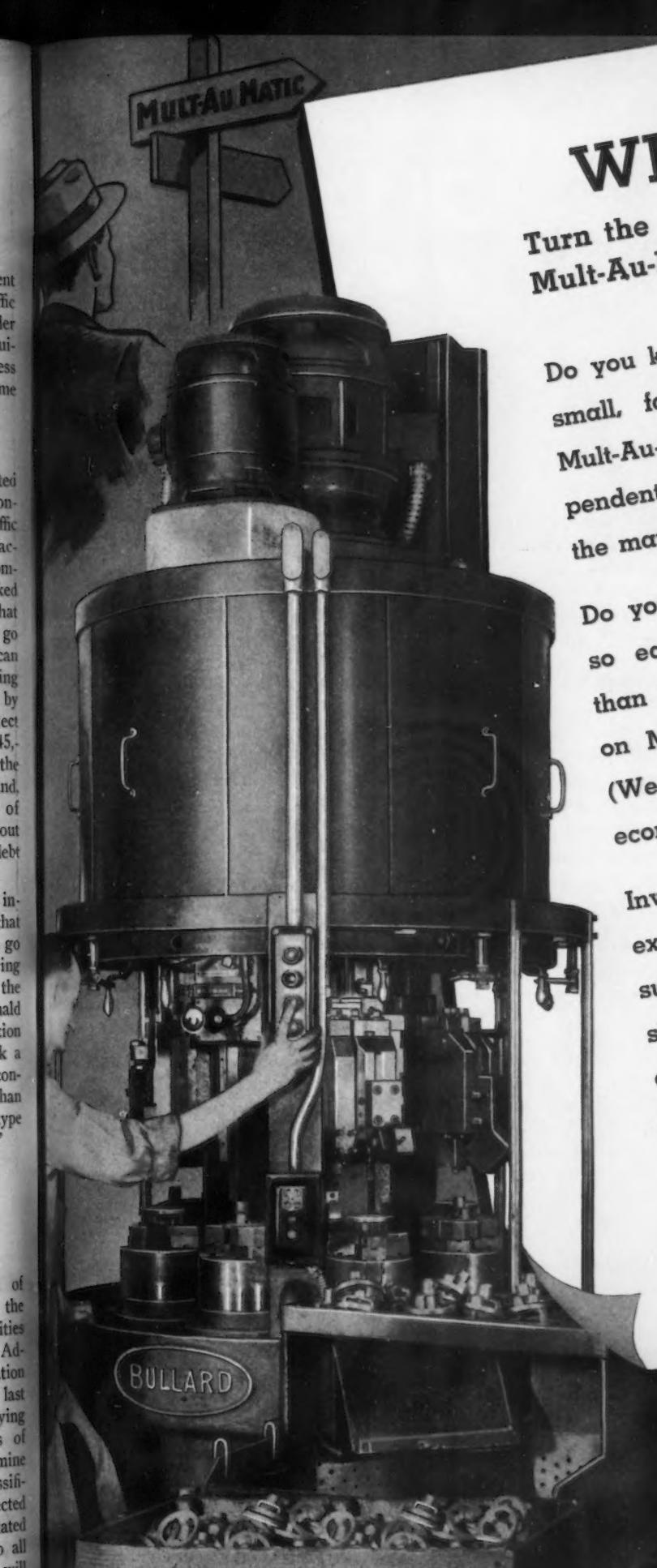
He said that other cities were interested in similar projects and that they were anxious in some cases to go ahead with the projects. Referring further to the provision covering the acquisition of land, Mr. MacDonald said that in his judgment that portion of the bill will do more to unlock a construction fund for removing congestion in metropolitan areas "than any other authority or any other type of action the Congress could take."

Railroads to Reclassify Products Shipped by Rail

WASHINGTON—Because of complexities arising from the ever increasing list of commodities transported by rail, the Traffic Advisory Committee of the Association of American Railroads began last week the work of further simplifying the classification of all products of industry and the rules which determine the application of the various classifications. Out of this work is expected to come a condensed consolidated freight classification applicable to all sections of the United States that will be more easily interpreted and applied by shippers and better meet the requirements of the public and railroads alike.

WHICH ROAD?

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Mult-Au-Matic Way



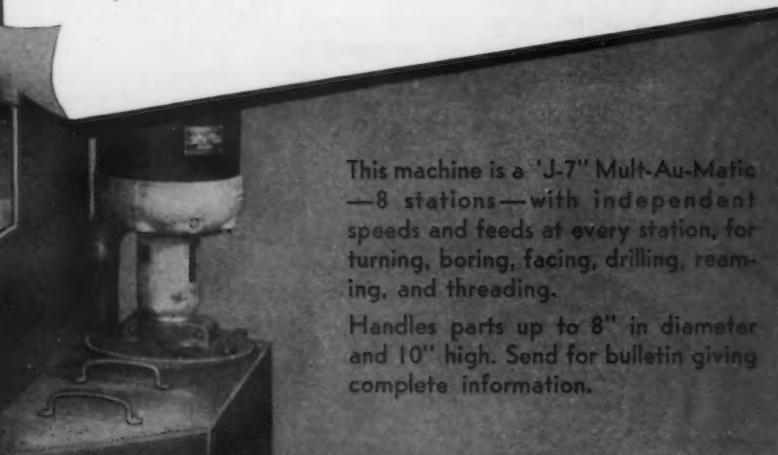
Do you know about the "J-7" and "J-11"—those small, fast machines which apply the proven Mult-Au-Matic method of independent feeds, independent speeds, and simultaneous operation to the manufacture of small parts?

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Invariably the first Mult-Au-Matic makes an excellent reputation, and its performance sells successive machines. Perhaps a study would show you savings and help speed your course on the Road to Progress. It will cost you nothing to consult a Bullard Engineer.

THE BULLARD COMPANY

July 20, 1939



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BRIDGEPORT, CONNECTICUT

Many Business Men Are Failures in Government, Says Roosevelt

WASHINGTON—Business men brought to Washington in the service of the administration have been given a low rating as public officials by President Roosevelt. Most of them were declared to have proved a failure. The percentage of failures with such men was said to be greater than among those with some experience in public life. The high ratio of failures among business men was attributed to their lack of understanding of the relationship of their own to other business. The President pointed out that it was not enough to understand the workings of one's own business to succeed in the Federal Government. Too many men, Mr. Roosevelt stated, knew the geography of their own localities but had no conception of the national problems.

The President delivered himself of these views in the course of a homily to newspaper correspondents at a press conference on Tuesday of last week. Though it was a vain effort, he was trying to convince them that there were no political considerations prompting the appointment of Paul V. McNutt as Federal Security Administrator. In grave tones, Mr. Roosevelt indulged himself in a characteristic lecture to say that some people are only too quick to jump at the conclusion that politics is the only consideration. He proceeded to picture Mr. McNutt's record in public service as ideally qualifying him for his new Federal job in Washington. Contrary to speculation of the still skeptical press, the moving of Mr. McNutt from the faraway office of High Commissioner of the Philippine Islands to a position under the eyes of the White House was not, according to assurance given, designed to put Mr. McNutt's 1940 Presidential ambitions in cold storage, locked out from a race with a tentative third term candidate. Mr. McNutt, the President said, would not be pressing his Presidential candidacy any more than 10 or 15 others in the Administration. Mr. McNutt, so it was said, would be no more concerned with politics than any member of the Cabinet, the Supreme Court or Congress. Apparently quickly realizing the equivocal quality of this observation, the President revised his statement to say that, of course, Congressmen and Senators were constantly working at politics.

This dig at legislators, some of whom are making themselves very disagreeable to the President these days, did not go unnoticed. No more so than his careful omission of reference to Presidents, who, of course, never work at politics.

Mr. Roosevelt really was seeking to show by invidious comparison the qualifications for public service, such as acquired by Mr. McNutt, as contrasted with the lack of qualifications for such service possessed by business men generally—not always, but in most instances.

Many Have Failed

There is much merit in what the President said. It is a notable fact that many business men who have been called to Washington have failed in the public service. This is a common opinion held even by those who have different economic views. Either because of lack of training or for other reasons many of them do not develop the breadth of view that is required of a competent public official, able to judge and act impartially on problems that confront him and concern the entire country rather than a business with which he is associated. Perhaps the Roosevelt Administration has brought to Washington a higher ratio of business men who have not made good in Government service than any preceding administration. Some have departed. Still in the service are others, who, whatever the Administration may think, are widely considered to be disqualified for the job.

On the other side of the shield, it may be pointed out that many business men have come to Washington and shown high qualifications for Government service. Some remain. But for the most part they are in subordinate positions and have little or no influence in shaping Government policies. Also called to Washington during the present administration are others, who, though thoroughly capable, have been either rebuffed or ignored, their work and advice disregarded unless it fitted the Administration pattern. Business men of this type who have left the Government service are numerous, while others of ability remain despite this discouraging treatment. Instances in which busi-

ness advice has been accepted have been rare. Too often political considerations have caused rejection of proposals coming from business men.

This being the case, failure can be laid at the door of high officials themselves who characterize business men generally as being provincial in their outlook and therefore not suited for important Government positions with their requirement for a wide horizon of administrative efficiency.

Other Failures in Government

It may be added, too, that contrary to Presidential inference, there are many with some, even wide, public experience who also are flops in Government service and the present Administration is shot through with this genry. Coming from various walks of life, Washington has a motley crew of bureaucrats who have had public experience but neither forget nor learn anything respecting the art of administration. They are not only insular but are doomed to the stature of amateurs because, thoroughly satisfied that they are possessed of omnipotence, they are insulated from learning. Intolerant, petty and vengeful, they administer by biased dictates, reveling in their temporary power to keep the business and the country generally in a state of uncertainty. Though their ideas on "planned economy" have proven fallacious, they persistently cling to them. Others are new to public service and show it by their officious attitude as they flounder about in their jobs, putting on a front to conceal their confusion. Then there are some new to public service who have developed ability as administrators but their voices in policy making all too seldom carry little or no weight.

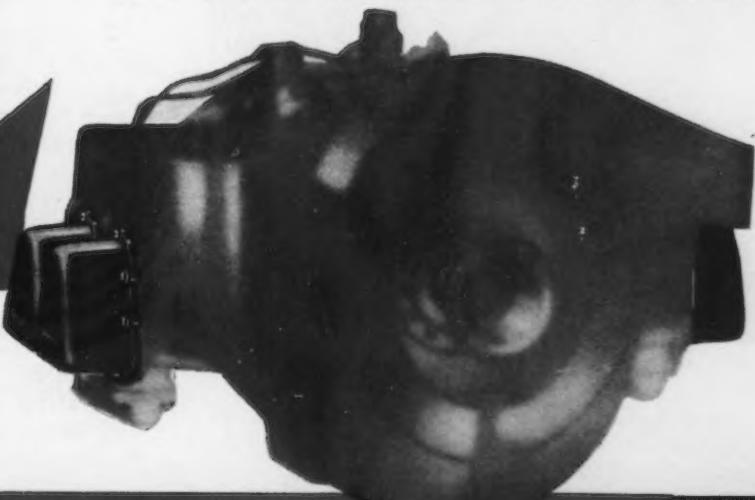
The upshot of the situation is that it is not possible to break down into fixed categories those who are successes or failures in the Government service. Much depends on the viewpoint. A successful public servant in the eyes of one administration undoubtedly could easily be a failure in the eyes of another. Mere theorists and crusaders or worse might "make good" in one administration while practical business men and sound theorists, even though having a broad grasp of national problems, might not be acceptable to one administration yet rated highly in another. Criticism has been made that the Roosevelt Administration has been all too ready to disregard the latter type generally, while retaining too few of them in the Government service.

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Labor Relations Board Adopts New Rules

WASHINGTON—Although the National Labor Relations Board's new rules permitting employers under certain conditions to petition the board for collective bargaining elections were obviously conceived to head off a concerted drive to revise the Wagner Act at this session of Congress, it is highly doubtful

that the move will have that effect for any extended period.

In the first place, acting to slightly liberalize its rule while under fire, is in itself an admission that its activities were not measuring up to the standards expected by employers and employees despite its prior assertions to the contrary. Also, the new rules, described by the board as "in the interest of a more effective administration of the act," are qualified to the extent that one provision stipulates that "the

board shall not direct an investigation on a petition filed by an employer unless it appears to the board that two or more labor organizations have presented to the employer conflicting claims that each represents a majority of the employees in the bargaining unit or units claimed to be appropriate."

In other words, if one of the unions complaining was a minor one, the board could determine that the claims were not conflicting, in which case the employer's petition would not be acted upon. There were indications, however, that in such event, particularly where there were two strong minorities involved, the NLRB might intervene on its own motion but there is no certainty as to this. Also undecided is the question of the legality of a minority strike, where a minority union, charging that an employer denied it a contract, decided to call a strike. Such questions and others remained unanswered by the board's newly-announced rules of procedure.

The New Rules

As summarized by the board the new rules, which became effective on July 14, will permit:

1. Employers to petition the board in representation cases where two or more labor organizations are claiming a majority but neither petitions the board for certification.
2. An increase from five to 10 days in the minimum period between the issuance of a complaint of unfair labor practice and the date of a hearing upon the complaint.
3. An increase from 10 to 20 days in the time allowed to file exceptions to intermediate reports of trial examiners, and a still further increase may be allowed "upon a showing of proper cause."
4. A regional director to investigate and report—the report to be served on the parties and to become a part of the record—if any objection is made to the conduct of an election.
5. Employers to amend answers to complaints free of some of the former restrictions imposed.
6. Regional directors to grant an application for subpoenas or refer it to a trial examiner, who also will be empowered to grant such applications.
7. The board or the chief trial examiner to appoint trial examiners. The former power of regional directors in this respect has been withdrawn.
8. The filing of briefs or written statements at the conclusion of hearings as a matter of right without being

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subject to permission of the trial examiner.

9. Trial examiners to retain or strike out at their discretion the testimony of a witness, the board explaining that "contemptuous conduct on the part of a witness need not exclude his testimony."

Henry Disston & Sons, Inc., Gets Armor Plate Contract

WASHINGTON — Led by a \$1,424,089 contract for armor plate awarded to Henry Disston & Sons, Inc., Philadelphia, by the War Department's Ordnance Division, Government contracts for iron and steel products as reported by the Labor Department's Public Contracts Division for the week ended July 8 totaled \$1,862,353. The contract for armor plate, which has never been made public by the War Department, was awarded on June 21 and calls for delivery on April 3, 1941.

Contracts for non-ferrous metals and alloys reported also for the week ended July 8 amounted to \$191,431; and for machinery, \$623,451. Details follow:

Iron and Steel Products

Lukenweld, Inc., Coatesville, Pa., slides, carriages and base rings.	\$60,948.00
Bantam Bearings Corp., South Bend, Ind., roller bearings, paths	149,640.20
Chas. F. Guyon, Inc., New York City, and Bethlehem Steel Co., Sparrows Point, Md., steel pipe.	14,348.79
Bethlehem Steel Export Corp., New York City, Bethlehem Steel Co., Sparrows Point, Md., and Lackawanna, N. Y., reinforcement bars, steel.	44,009.12
Henry Disston & Sons, Inc., Philadelphia, armor plate.	1,424,089.40
Lukens Steel Co., Coatesville, Pa., plates, steel.	78,042.60
Stewart Warner Corp., Chicago, bodies, steel.	33,930.00
Dixie Metal Products Co., Inc., Birmingham, Ala., bombs, practice.	15,600.00
American Bridge Co., Denver, structural-steel framing.	12,260.00
Blaw-Knox Co., Pittsburgh, Consolidated Expanded Metal Co., Beechbottom, W. Va., structural steel base adapters.	15,687.55
The Columbia Machine Works & Malleable Iron Co., Brooklyn, N. Y., chests, field.	13,308.30

Non-Ferrous Metals and Alloys

Pollak Mfg. Co., Arlington, N. J., containers, cartridge, aluminum.	\$43,065.00
Aluminum Co. of America, Massena, N. Y., Edgewater, N. J., Detroit and Cleveland, aluminum and aluminum alloy.	32,251.76
Phelps Dodge Copper Products Co., New York City and Bayway, N. J., tubes, condenser, copper.	106,322.46
Swift & Sons, Inc., Hartford, Conn., gold and bronze leaf.	9,292.00

Machinery

Chicago Pneumatic Tool Co., Philadelphia and Franklin, Pa., air compressors.	\$19,975.00
Allis-Chalmers Mfg. Co., Milwaukee and Springfield, Ill., tractors.	14,218.00
Allis-Chalmers Mfg. Co., Milwaukee, tractors.	22,886.00
Moore Machinery Co., San Francisco, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis., machine, drill.	22,966.00
Cleveland Automatic Machine Co., Cleveland, screw machine.	15,603.80
Pratt & Whitney, Division Niles-Bement-Pond Co., Hartford, Conn., borer, jig.	10,859.00

Cincinnati Planer Co., Cincinnati, planer.	20,986.00
A. B. Farquhar Co., Ltd., York, Pa., hydraulic press.	20,610.00
Lloyd & Arms, Inc., Philadelphia, Hendey Machine Co., Torrington, Conn., rebuilding and modernizing Hendey lathes.	22,084.95
Ex-Cell-O Corp., Detroit, grinder.	11,996.50
Lodge & Shipley Machine Tool Co., Cincinnati, lathe, engine.	14,070.00
Colonial Broach Co., Detroit, broaching machine.	10,995.00
Niles-Bement-Pond Co., Pratt & Whitney Division, Hartford, Conn., profilers.	23,646.00
Colonial Broach Co., Detroit, broaching machines.	17,065.00
Bay City Shovels, Inc., Bay City, Mich., power shovel.	17,380.00
Miehle Printing Press & Mfg. Co., Chicago, printing presses.	103,670.00
Kingsbury Machine Tool Corp., Keene, N. H., drilling and reaming machine.	12,570.00
Gloekler Mfg. Co., Erie, Pa., refrigerators.	23,430.00
Sanitary Refrigerator Co., Fond du Lac, Wis., refrigerators.	36,460.00
McKiernan-Terry Corp., Harrison, N. J., capstan, electric.	33,750.00
Leslie Co., Lyndhurst, N. J., whistles, steam, electric.	13,448.88
Manning, Maxwell & Moore, Inc., Bridgeport, Conn., valves, steel.	59,166.28
Finnell System, Inc., Elkhart, Ind., floor scrubbing machines.	18,900.00
Henrich Laundry Machinery Co., Boston, washing machines.	13,300.00
American Blower Corp., Detroit, Mich., Star Electric Co., Bloomfield, N. J., ventilating fans.	10,414.70
Finnell System, Inc., Elkhart, Ind., floor scrubbing machines.	15,000.00



Protect Your Workers with

MORTON'S SALT TABLETS

Heat-Fag is real — an unseen but powerful force that rides every hot wave . . . a force that costs industry thousands of dollars each year. For, hot days and heavy work make men sweat — and, unless the salt that's sweated out of their bodies is replaced, Heat-Fag takes its toll, production sags and profits suffer. This fact is known by medical men everywhere and by safety directors, executives and plant superintendents.

Prevent HEAT-FAG in Your Plant

Place Morton's Salt Tablet Dispensers at drinking fountains. These modern, sanitary dispensers represent the most efficient and economical way to provide workers with salt. A single push of the lever dispenses one tablet at a time.

MORTON'S SALT TABLETS

Dissolve in 50 Seconds

They are easy to take — dissolve quickly. Only the purest and most highly refined salt is used.

Anticipate the Hot Days Ahead

Install Morton's Dispensers and Salt Tablets in your plant now. Place your order today. Remember — a small investment now will pay big dividends in Heat-Fag protection. Shipment will be made promptly — prepaid.

Write for folder — "Heat-Fag"



MORTON SALT COMPANY CHICAGO, ILLINOIS

War Department Orders Total \$10,534,786

WASHINGTON—The War Department last week awarded contracts totaling \$10,534,786, the largest of which was a \$1,562,000 order given to Sperry Gyroscope Co., Inc., Brooklyn, N. Y., for anti-aircraft searchlights. The General Electric Co., Schenectady, also received a \$1,230,340 contract for anti-aircraft

searchlights, the two orders comprising the bulk of the \$2,807,315 in orders awarded for the Corps of Engineers.

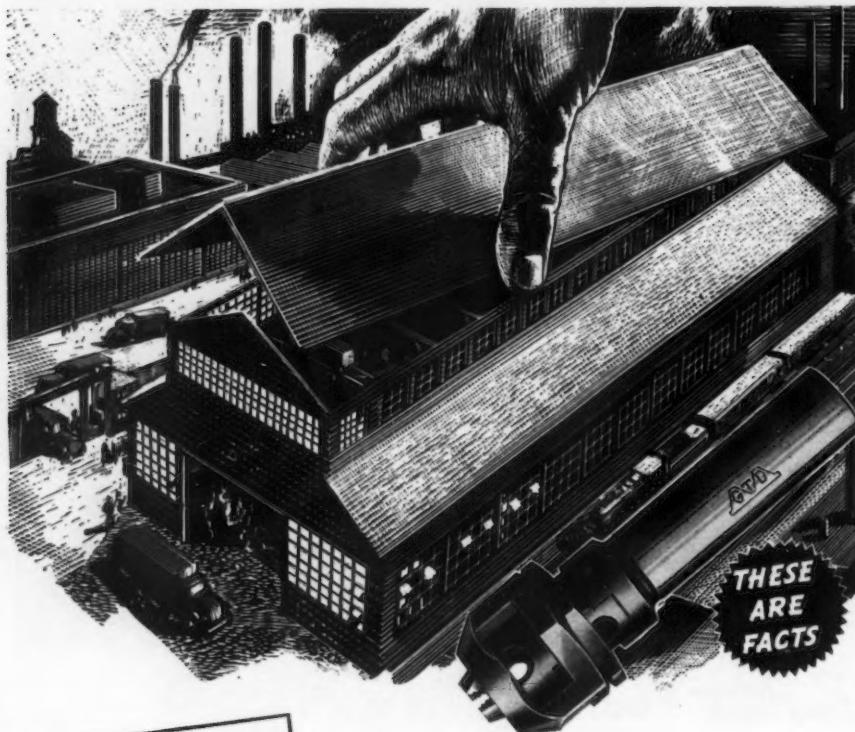
Ordnance Department awards amounted to \$162,884, orders under the ordnance special machinery program going to these companies:

Acme Coppersmithing Machine Co., Orelan, Pa., sets of equipment for ether recovery and manufacture, \$96,000; Henry Prentiss & Co., Inc., New York, milling machine, \$1248; Stedfast & Roulston, Inc., Boston,

two special machines and one milling and drilling machine, \$23,295; Production Tool & Die Co., Inc., Springfield, Mass., special machine, \$2150; Pratt & Whitney Co., Hartford, Conn., profile machines, \$23,646, and machinery for cooling system, \$2360; Ex-Cell-O Corp., Detroit, stoning machine, \$1262; and the Norton Co., Worcester, Mass., special machinery, \$8708.

Awards under the inspection gage program went to Pratt & Whitney Co., Hartford, \$1919; Hansen Whitney Machine Co., Hartford, \$1111; and the Moore Special Tool Co., Bridgeport, \$1184.

Orders placed for the Air Corps totaled \$4,536,949, the largest of which was a \$730,288 contract awarded Wright Aeronautical Corp., Paterson, N. J., for spare parts for aeronautical engines and test expenses.



"ACORN" Dies RE-ROOF A PLANT?...

Here's how... "Acorn" Dies have saved us the cost of a new roof in the past eighteen months," writes a midwest manufacturer, "on this type of job."

"Production threading of a zinc die casting at high speed—1100 R.P.M. on and 2200 R.P.M. off. 'Acorn' Dies gave us 1200 pieces an hour, with no apparent wear after 10,000 pieces."

If you have a troublesome job in your plant give "Acorn" Dies a chance at it. 9 times out of 10 you'll find substantial savings.



GREENFIELD

GREENFIELD TAP & DIE CORPORATION

Greenfield, Mass.

Detroit Plant: 2102 West Fort Street

Warehouses in New York, Chicago, Los Angeles and San Francisco

In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ontario

British Machine Tool Trade At All-Time Peak

WASHINGTON—Production of machine tools in Great Britain during 1938 reached an all-time peak, with the total output reaching a value of £12,000,000, a 20 per cent increase over 1937. A report to the Commerce Department also said that the industry plans ultimately to utilize its capacity to eliminate imports as a serious factor and to gain a stronger foothold in overseas markets.

Despite the demands imposed by the armament program, the report said, the industry was able to expand its export trade from £2,151,000 in 1937 to £4,476,000 in 1938. Bulk of the machine tool exports consisted of general purpose units. Russia was the outstanding foreign market in 1938, accounting for nearly 40 per cent of the total shipments, the department said. Australia, Japan, South Africa, British India and France also were important purchasers during 1938.

Reflecting armament program requirements, British machine tool imports reached the relatively high total of £4,962,000 in 1938 as contrasted with £6,212,000 in 1937. American machine tools accounted for more than 50 per cent of the 1938 imports. Excepting a few heavy milling machines, the report pointed out, imports from the United States were largely made up of special type of machinery which the British manufacturers either could not make, or could not make economically or rapidly enough.

Independent Union Placed on Ballot By Court's Order

MILWAUKEE — The Federal Court of Appeals at Chicago has handed down a decision that the independent union of the Falk Corp., employees of Milwaukee, an inside union, be placed on the ballot in the event of an election to determine bargaining representatives of Falk employees. The CIO Iron, Steel and Tin Workers of North America brought charges of unfair labor practices against the Milwaukee corporation in 1937 and after a series of hearings the National Labor Relations Board ordered that the ballot in an election be limited to the CIO union for production workers and the AFL craft union for power plant workmen.

Falk took the case to Federal Court, contesting the right of the Labor Board to limit an election. The court action was protested by the Labor Board on the ground that the court had no jurisdiction on Labor Board orders, before an election was actually held, and that the board was within its rights to exclude the so-called company union.

"This is the first decision from the Federal courts to the effect that an independent union which the labor board claimed was dominated by the employer should be included on an election ballot," A. J. Engelhard, attorney for Falk said.

Construction Industry Being Probed in 10 Cities

WASHINGTON—"We will expose racketeering and drive it to cover by prosecution," said Attorney General Murphy at a press conference last Thursday in announcing plans of the Department of Justice for grand jury investigations into restraints in the building construction industry. He said investigations were under way in 10 cities, among which he named New York, St. Louis, Cleveland, and Detroit. Action, he stated, will be taken against contractors, labor unions or their officials and any others who might be responsible for "artificial prices" in the industry and is expected by the end of September.

Conditions in the industry were called scandalous by the Attorney General. Among other things which he said the department was inquiring into are "kickbacks"—the return of sums of money by union workers to contractors. Mr. Murphy took oc-

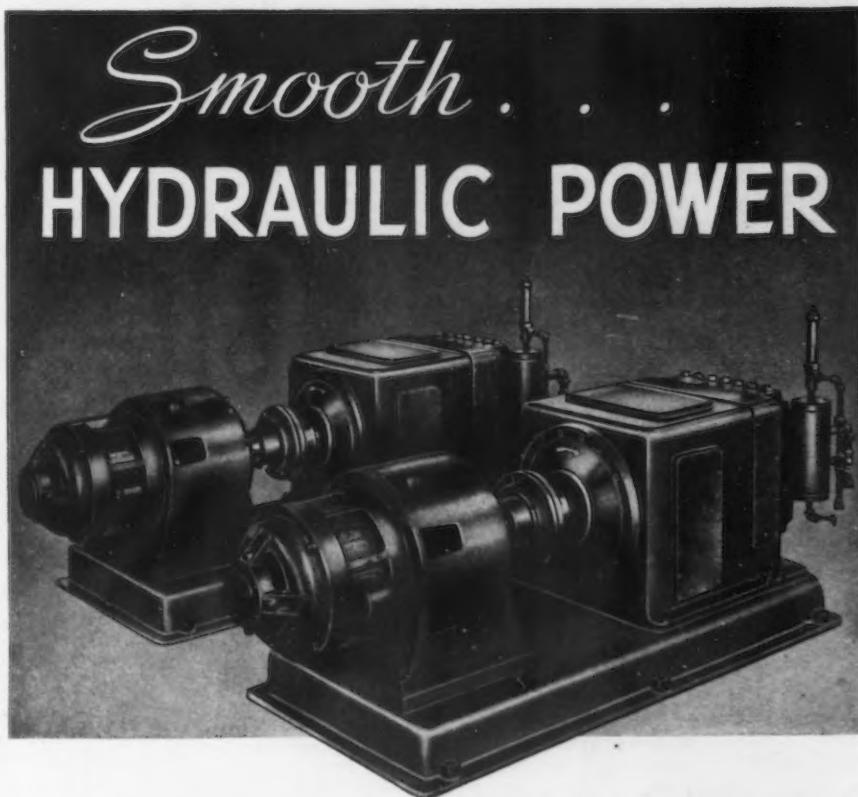
casion to say that "no honest union man need be concerned" over the prosecutions.

Westinghouse Shows How Income Dollar Is Spent

A pictorial dollar, emblematic of the \$160,000,000 gross income of the Westinghouse Electric & Mfg. Co. in 1938, is used to explain to employees the way the money earned by the company was spent.

Of the 100 cents in the pictured dollar, 42c. was used to meet the payroll of the company, and 28.7c. for materials and supplies. These two items accounted for 70.7c., leaving 29.3c. for the following:

Employee benefits, annuities, group insurance	2.9c.
Dividends to stockholders	4.2c.
Surplus	1.3c.
Provision for depreciation	4.7c.
Transportation	2.8c.
Advertising, publications and miscellaneous sales expense	5.0c.
Patents, royalties, office expenses, etc.	1.9c.
Rents, insurance, power, fuel, water, etc.	2.0c.
Taxes	4.5c.



W-S HYDRAULIC
TRADE NAME

**Hydraulic Presses
For Every Purpose**

High Pressure Pumps

**Accumulators
Hydro-Pneumatic
Weighted Types**

Operating Valves

Leather Packings

Forged Steel Fittings

Stediflo Hydraulic Pressure Pumps utilize a greatly improved design that results in more efficient operation and more compact installations. A circular arrangement of plungers, actuated by a swash plate, insures high efficiency and greatly reduced pulsation.

Made in capacities from 1500 lbs. per sq. in., and upward, for oil, water or any liquid, they can be easily equipped with special bodies and plungers for low pressures or corrosive liquids.

Take advantage of our expert service to get hydraulic pumps and presses "engineered to your jobs" for greatest economy and efficiency.

THE WATSON-STILLMAN CO.

107 Aldene Rd., ROSELLE, N.J.

THE NEWS IN BRIEF

Second lot of 5000 engines ordered for Crosley cars.—Page 55.

Ford to erect new car delivery building.—Page 55.

Automobile production to stage sharp decline starting this week from 61,610 unit post-holiday output. New unit headlamps to make appearance on 1940 cars.

Packard to be the first automobile company to bring out 1940 models, which will appear in August.—Page 58.

Low-priced alloy steels taking precedence over more complex alloys in automobile manufacturing.—Page 58.

Railroads to reclassify commodities shipped by rail.—Page 60.

President Roosevelt's \$3,860,000,000 spend-lend program moves into the final hearing stage in Senate.—Page 60.

Business men in Government service given a low rating by President Roosevelt.—Page 62.

Labor Relations Board adopts new rules of procedure: employers permitted to petition in certain cases.—Page 64.

Henry Disston & Sons, Inc., awarded \$1,424,089 contract for armor plate.—Page 65.

British machine tool trade at new high; American tools more than 50 per cent of imports.—Page 66.

War Department orders total \$10,534,786, including \$1,562,000 for Sperry Gyroscope Co.—Page 66.

Westinghouse Electric & Mfg. Co. shows its employees how its income dollar is spent.—Page 67.

Federal Court of Appeals at Chicago orders independent union of the Falk Corp., Milwaukee, to be placed on ballot in collective bargaining election.—Page 67.

Construction industry being investigated in 10 cities, says Attorney General Murphy.—Page 67.

Arthur G. McKee & Co.'s business running 60 per cent ahead of that in 1938.—Page 70.

Westinghouse Electric & Mfg. Co. announces fluorescent lighting for industrial plants.—Page 70.

Special refractories will be subject of discussion at fall meeting of refractories division of American Ceramics Society.—Page 71.

A market for American metal furniture in India is reported by Department of Commerce.—Page 71.

Commercial standard for cast iron enamel ware announced by Bureau of Standards.—Page 71.

War Department now authorized to purchase equipment and supplies for experimental purposes without competitive bidding.—Page 71.

Ships and airplanes took bulk of Government contracts under Walsh-Healey Act in past three years.... Structural steel heads list of iron and steel products.—Page 76.

Miners who struck ask unemployment compensation.—Page 76.

Price relationship of No. 1 and No. 2 scrap shows little change in past five years.—Page 80.

International Harvester Co.'s new tractor.—Page 80.

Standard Oil Co. of New Jersey issues a simplified and illustrated financial report so that employees may understand it.—Page 81.

Lukens Steel licensed to produce Ledloy.—Page 81.

Chain Belt Co. stockholders approve acquisition of Baldwin-Duckworth Chain Corp.—Page 81.

Fast passenger ship planned for Great Lakes.—Page 96.

Farm machinery plant at Horicon, Wis., shuts down for 60 days because of lack of orders.—Page 99.

Machine tool sales active in most parts of the country, recovering from slow holiday week.—Page 99.

Domestic orders for machine tools gained slightly in May; foreign orders off.—Page 99.

TNEC recommends strengthening of anti-trust laws, including amendment to prevent one corporation from acquiring assets of a competing corporation.

PWA program was 38 per cent completed on June 30.

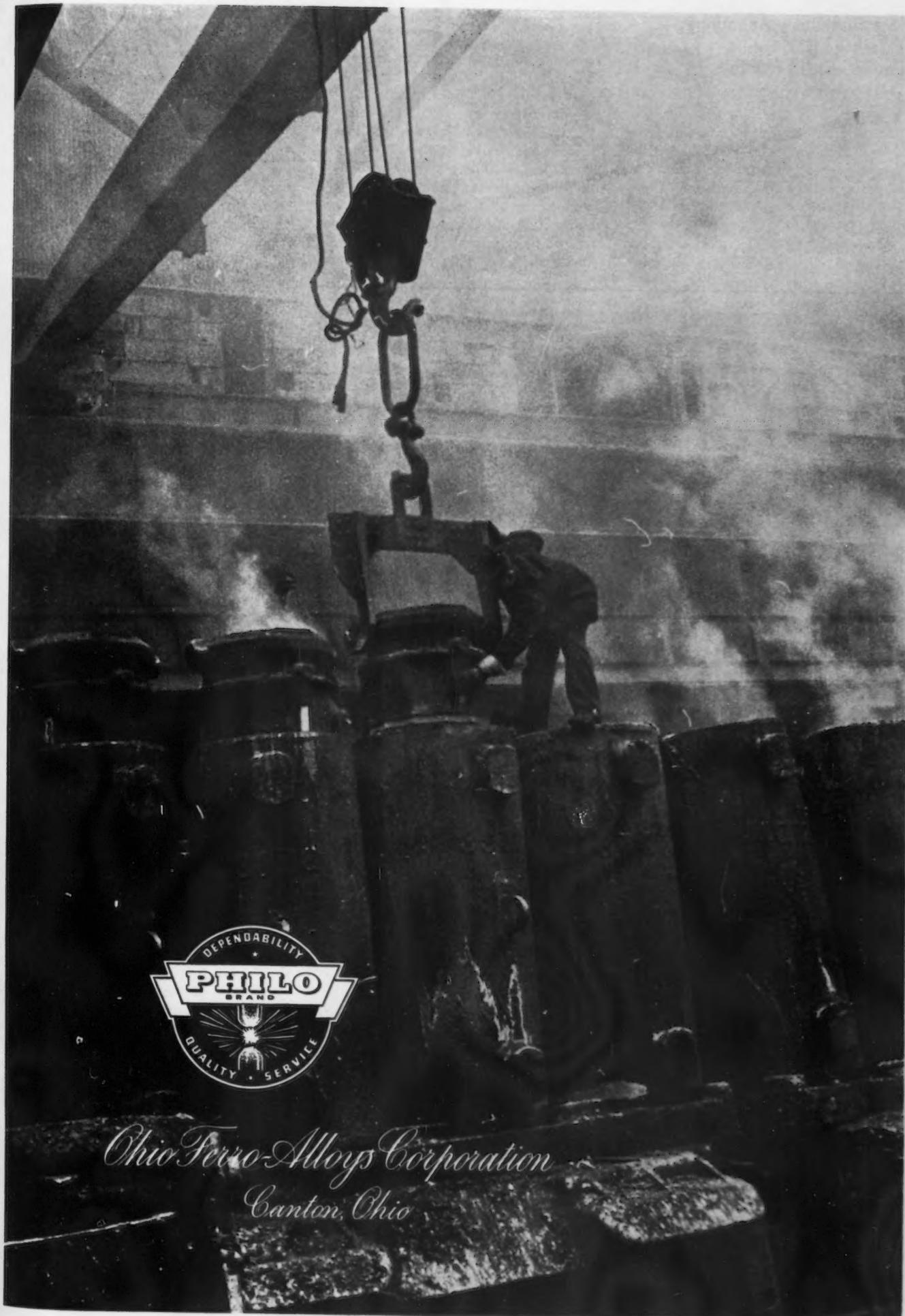
Communists cannot seize steel union, secretary of SWOC declares.

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MEETINGS

Aua. 28 and 29—Institute of Scrap Iron and Steel, Cleveland.	
Aua. 28 to 31—American Mining Congress, Salt Lake City.	
Sent. 8 and 9—American Ceramic Society, Conneaut Lake, Pa.	
Sept. 20 to 22—National Industrial Advertisers Association, New York.	
Sept. 26 to 29—Association of Iron and Steel Engineers, Pittsburgh.	
Oct. 4 to 13—National Machine Tool Builders' Association, Cleveland.	
Oct. 5 to 7—Society of Automotive Engineers, aircraft production meeting, Los Angeles.	
Oct. 16—Society of Automotive Engineers, annual dinner, New York.	
Oct. 23 to 27—National Metal Congress, Chicago.	
Nov. 16 and 17—Porcelain Enamel Institute, New York.	



Westinghouse Announces Fluorescent Lighting For Industrial Plants

CLEVELAND—About 210 jobbers and special guests were in session here July 14, 15 and 16 at the annual lighting school conducted by Westinghouse Electric & Mfg. Co., Lighting Division, Edgewater Park. The attendance was considerably ahead of last year.

New developments in commercial, industrial, municipal and special light-

ing were unfolded during the three-day program.

Announcement of a new line of industrial lighting fixtures for fluorescent lamps was one feature of the session Saturday, July 15, on industrial lighting. The fixture line in this division covers 24-in., 36-in., and 48-in. lamps. The company will make these fixtures for both one and two lamps with separate reflector for each lamp. Reflectors, which with the control unit are in a steel housing, are of aluminum treated by the Alzak proc-

ess. On the 36-in. and 48-in. sizes two points of suspension are provided.

Jobbers were told advantages of fluorescent lighting include an extended low brightness source, increasing the diffusion and reducing glare.

To the Millite line it was announced a 500-watt size will be added and the unit will be made weatherproof for outside industrial applications. Originally introduced two years ago, these luminaires are now impervious to vapor.

A third announcement at the industrial session covered new supplementary industrial units called industrial concentrators, in two sizes. These are used for concentrating light in a specific area in conjunction with general lighting. The 10-in. size is provided for 150 or 200-watt lamps and the 14-in. size for 300 or 500-watt lamps. The units are available with clear, stippled, or spread lenses and diffused or specular aluminum reflectors, totally inclosed. Both sizes have a cast socket housing with adjustable swivel for mounting on conduits.

F. C. Winkler, Westinghouse design engineer, pointed out at the industrial session that the cost of light really includes taxes, interest, depreciation, equipment and wiring; cost of lamp renewals; and power cost. Some of these factors often are lost sight of by plant owners, he said. Cost analysis charts were distributed to the jobbers.

McKee's Business Running Well Ahead of 1938

CLEVELAND—At the end of the second quarter the volume of contracts for 1939 for Arthur G. McKee & Co., engineers and contractors, was approximately 60 per cent in excess of the same period of 1938, according to a recent letter to stockholders.

So far this year the volume of foreign and domestic business received by the company more nearly conforms to a normal division, foreign contracts being approximately 51 per cent of the total. The year 1938 was unusual in that over 90 per cent of the total volume of contracts was for installation in foreign countries.

Directors of the company have decided to discontinue operation of the steel plate and structural fabrication business conducted at Pulaski, Va., and to dispose of the land, buildings and equipment, as operation of this plant has been unprofitable for some time.

RESPONSIVENESS



HELE-SHAW Fluid Power HAS IT!

The alert way a dog obeys every command of his master closely parallels the responsiveness of a Hele-Shaw Pump. At the simple shift of a lever, turn of a wheel or touch of a button, Hele-Shaw Fluid Power starts, stops or reverses. It does these things instantly or gradually—depending on the type of Hele-Shaw Regulator used—and without complicated electrical or mechanical controls. Nimble responsiveness is but one of the many practical, usable advantages of Hele-Shaw Pumps and Fluid Power. Make a point of investigating these advantages for machines you design, build or buy. Ask us to show you how we can put Hele-Shaw Fluid Power to work for you.

Other A-E-CO Products:
Lo-Hed Hoists, Taylor Stokers,
Marine Deck Auxiliaries.



A-E-CO
Hele-Shaw
FLUID
POWER

AMERICAN ENGINEERING COMPANY

2410 ARAMINGO AVENUE, PHILADELPHIA, PA.

War Dept. May Buy for Experiments Without Bids

WASHINGTON—Under a bill approved early this week by President Roosevelt, the War Department is authorized to purchase equipment and supplies for experimental and test purposes either abroad or in this country with or without competitive bidding. Designed to increase the efficiency of the national defense program, the measure provides, however, that quantity purchases shall be subject to the usual rule requiring competitive bidding.

Commercial Standard for Cast Iron Enamelled Ware

WASHINGTON—A commercial standard for cast iron enamelled ware designed to improve the general serviceability, quality and acceptance of this ware to the mutual advantage of all concerned, has been announced by the National Bureau of Standards, Department of Commerce. The standard was proposed by the Sanitary Cast Iron Enamelled Ware Association and embodies some changes suggested by the 35 interested national organizations to whom it has been submitted for comment. At least 65 per cent of the productive capacity of the industry must indicate their willingness to adhere to the recommendation before it is officially published by the Bureau of Standards.

A Market in India for American Metal Furniture

WASHINGTON—Several factors favorable to the development of a market in India for American-made metal furniture was reported this week by Commerce Secretary Hopkins whose observations were based upon a survey conducted by the Specialties Division, Bureau of Foreign and Domestic Commerce.

Special Refractories Will Be Probed by Ceramic Group

THE use of special refractories in the non-ferrous and steel industry will be the principal subjects discussed at the fall meeting of the Refractories Division of the American Ceramic Society, to be held at Oakland Beach Hotel, Conneaut, Pa., on Sept. 8 and 9.

The meeting has been planned to be of particular interest to consumers of refractories and ample time has been provided for discussion of the papers to be presented at the two sessions.

Committee C-8 of the American Society for Testing Materials is holding its meeting at the same place on Sept. 7, and those attending this meeting are reported to be planning to stay over for the ceramic group's sessions.

Germany Increases Swedish Ore Purchases

LONDON—German industrialists are now completing arrangements to secure a constant supply of Swedish iron ore against an emergency. At first

they tried to obtain control of the ore mines, but Swedish law forbids foreigners to hold shares in iron mines. So the Germans have fallen back on the system of long-term purchase contracts. They are stated to be taking 75 per cent of the ore from the Graengesberg company, Sweden's richest producing unit.

Urquhart Service Co., 1501 Wynkoop Street, Denver, Colo., and 417 Dooley Block, Salt Lake City, Utah, has been appointed sales representatives of the Ajax Flexible Coupling Co., Westfield, N. Y.

"What Do You Do For Metal Cleaning Troubles?"



"Easy Enough . . . Call The Wyandotte Man"



YOUR Wyandotte Service Representative is always on call. Like a doctor or a fireman, he specializes in emergencies.

But emergencies are often expensive and many metal cleaning departments *avoid* them by keeping in close touch with their Wyandotte service men.

If he is familiar with your metal cleaning problems, trouble is less apt to happen and, if things do go wrong, he will be able to help you straighten them out more quickly.

Why not call your Wyandotte Service Representative today? He'll be glad to give you the benefit of his varied experience with metal cleaning problems. There is no charge for his services and, frequently, he can save you time, money and energy.



TNEC Recommends Strengthening of Anti-Trust Laws

WASHINGTON—The Temporary National Economic Committee, which has been in existence for slightly more than a year and has spent an estimated \$620,000, recommended in a preliminary report to Congress early this week civil remedies for enforcement of the anti-

trust laws, amendment of the Clayton Act to prevent one corporation from acquiring the assets of a competing corporation, procedural changes to speed up patent law litigation and further prohibitions upon the use of patents for trade restraints. The TNEC report was understood to have the ap-

proval of all TNEC members except Senator King, Democrat of Utah, who has been described as "the lone wolf" of the committee.

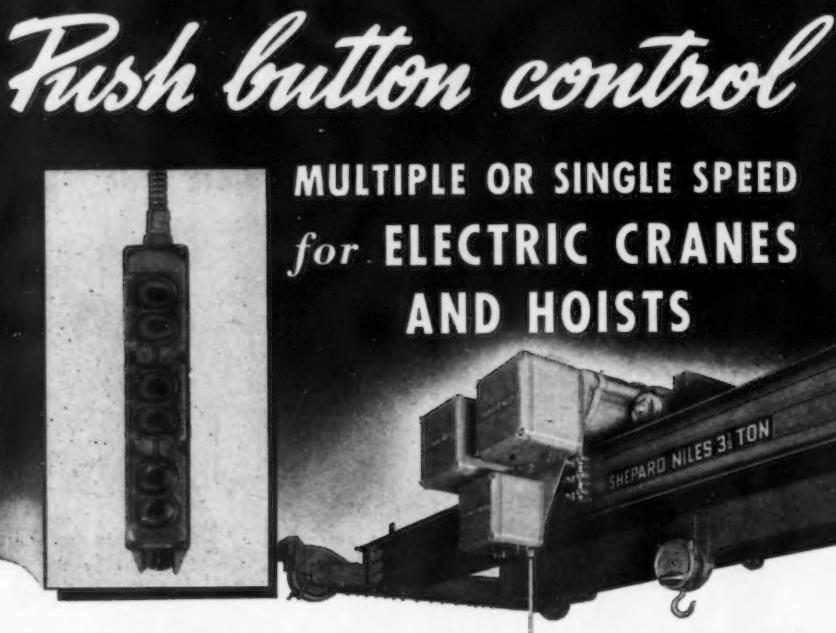
Actually, the recommendations are not new since they represent proposals advanced by three of the six Government departments represented on the committee. Civil remedies for enforcement of the anti-trust laws recently have been urged by the Justice Department and are embodied in a bill introduced in the Senate by Senator O'Mahoney, committee chairman. On existing anti-trust law policy, the Justice Department takes the position that the only remedy available to the department, an action in equity to enjoin a violation or threatened violation, is an almost useless preventative.

Revision of the Clayton Act, prohibiting one corporation from acquiring the assets of a competing corporation, has been urged by the Federal Trade Commission since 1930. In the words of Chairman O'Mahoney, the proposed amendment would only prevent what the Clayton Act was intended to prevent in the first place.

Patent Bills Pending

The suggested procedural changes in patent laws, endorsed by the Department of Commerce, are already the subject of bills which have been passed by the House. Among other things, these measures would terminate interference procedure, abolish renewal applications, reduce the public use period before filing an application from two years to one, and broaden the power of the Commissioner of Patents so that applicants to an office action can respond in less than the normal statutory period of six months. Other proposals which have been favorably reported to the Senate but which have not been acted upon in the House include one to establish a single court of patent appeals, designed to reduce the time and cost of litigation, and another to limit the life of a patent to 20 years from the date of filing application.

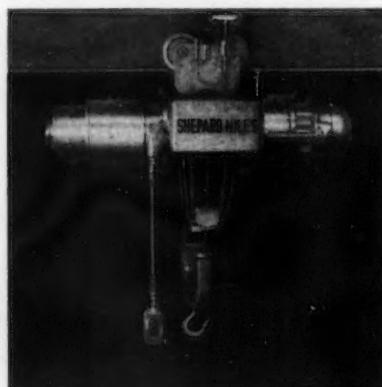
Fortified with a \$390,000 balance to continue its investigation, the TNEC is scheduled to make its final report in February. The report promised that the final document will reflect "as comprehensive and objective a picture as possible." The committee emphasized that the report just issued was "preliminary," insisting that at this stage of the inquiry a thorough-going revision of the anti-trust procedure while not warranted may be "definitely indicated for the future."



SHEPARD NILES multiple speed push button control provides 5 selective speeds by one push button for each travel motion. Each button as it is pressed inward makes five electrical contacts, corresponding to five independent speeds in each direction of travel.

Push button master switch cases are of aluminum alloy and made slender enough to be grasped easily with the hand. An assembly of two or three master switches in tandem can be furnished for the control of 2-motor and 3-motor cranes and hoists. An emergency stop switch is provided at the lower end of the assembly.

Shepard Niles multiple speed push button control for all 6 travel motions applied to 3-motor electric traveling crane.



Shepard Niles LiftAbout equipped with single speed push button control.



... OBITUARY ...

SNOWDEN SAMUEL, president of Frank Samuel & Co., Inc., Harrison Building, Philadelphia, and son of the late Frank Samuel, who founded that firm of iron and steel merchants, died Sunday in Bryn Mawr Hospital, after an illness of a few weeks. Mr. Samuel entered business life in 1912 as an employee of the American-Swedo Iron Co., Danville, Pa., a subsidiary of Frank Samuel & Co. He gave up this



SNOWDEN SAMUEL

position for service during the World War and after the war supervised the activities of the American-Swedo Iron Co. from Frank Samuel & Co.'s Philadelphia office. Mr. Samuel was secretary and treasurer of the American-Swedo company from 1919 to 1923, at which time he was admitted to the partnership of Frank Samuel & Co. When the firm was incorporated in 1932, he became secretary and treasurer, and on the death of his father in 1934, he succeeded to the presidency. In 1928 he was one of the organizers of the Wrought Iron Research Association and served as their secretary and treasurer until they disbanded in 1931. Mr. Samuel was 46 years of age.



CHARLES C. KLINGMAN, for many years office manager of the Cleveland Wire Spring Co., Cleveland, died July 14, at the age of 55. He began his

business career with the American Steel & Wire Co., Cleveland, and worked there from 1903 to 1905 when he went to the Cleveland Wire Spring Co. A graduate of Baldwin-Wallace law school, he was admitted to the bar in 1908 but never engaged in the practice of law.



CALVERT C. CANFIELD died July 15 at Cleveland at the age of 75. He had been in poor health for three

months. Mr. Canfield retired in January, 1937, as manager of the marine department of Pickands, Mather & Co., Cleveland, and assistant secretary and treasurer of the Interlake Steamship Co. For many years he was a director of the Lake Carriers' Association.



RALPH W. GRANT, plant manager of the Clifton, N. J., division of the National Rubber Machinery Co., died on June 27.

CLEVELAND TRAMRAIL



OVER HEAD HANDLING EQUIPMENT

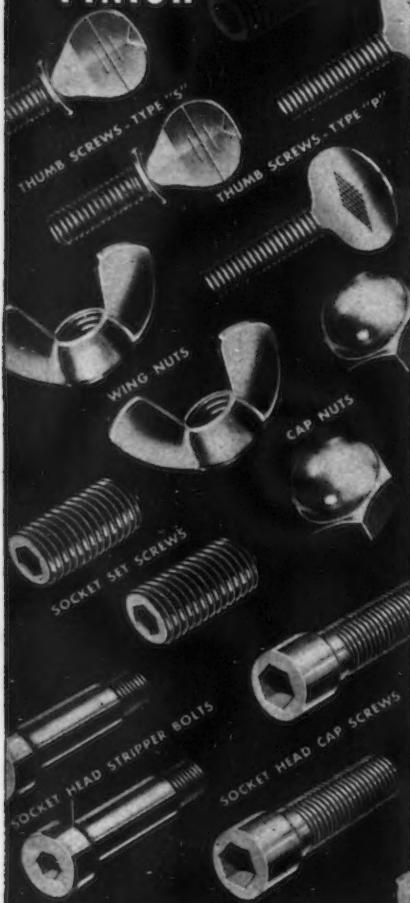


- An extensive Tramrail Transfer System in a large steel warehouse, where miscellaneous loads are handled.
- Thirty-two kegs, each weighing one hundred pounds, are lifted on each trip of the pallet.

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THE CLEVELAND CRANE & ENGINEERING CO.
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Division of
Dr. Consult Your Phone Directory under Cleveland Tramrail



Cold-forged FOR STRENGTH... UNIFORMITY... FINISH



Produced by an improved process, developed through years of experience in the manufacture of precision screw products, Parker-Kalon Wing Nuts, Cap Nuts, Thumb Screws and Socket Screws have the quality that wins unqualified approval of engineers and production men. Write for free samples . . . compare . . . see for yourself. Stocked by reliable industrial distributors near you. PARKER-KALON CORP. 200 Varick St., New York, N.Y.

PARKER-KALON

Cold-forged

SOCKET SCREWS
WING NUTS · CAP NUTS
THUMB SCREWS

SOLD THROUGH REPUTABLE DISTRIBUTORS

PERSONALS . . .

B. B. WILLIAMS, president, Cooper-Bessemer Co., Mount Vernon, Ohio, recently was honored at a dinner at Grove City, Pa., on the 10th anniversary of the merging of the former Bessemer Gas Engine Co., Grove City, and the C. & G. Cooper Co., of Mt. Vernon.

* * *

HOYT E. HAYES, president and treasurer of the Industrial Brownhoist Corp., Bay City, Mich., recently was elected to the board of directors of the Peoples Commercial and Savings Bank, Bay City.

* * *

THOMAS H. CORPE, who after distinguished service in the Canadian and Royal Air Forces in the World War, joined General Motors Corp. as an engineer, has been named sales executive in charge of advertising and promotion for the Lockheed Aircraft Corp., Burbank, Cal. Until a year ago, Mr. Corpe was advertising manager for Buick.

* * *

WILLIAM G. HASSEL has been appointed Detroit district manager of the Pittsburgh Crucible Steel Co. in charge of sales and metallurgical activity. He succeeds W. W. NOBLE, who has been transferred to the Cleveland office as district manager.

* * *

H. LEIGH WHITELAW has become associated with the Jones & Laughlin Steel Corp., Pittsburgh. He formerly was vice-president of the American Gas Products Corp.

* * *

W. R. CUNNICK, assistant vice-president of the Weirton Steel Co., Weirton, W. Va., who has been located in Detroit, in charge of sales to the automotive industry, will have his headquarters in the general office in Weirton. He will have jurisdiction over all sales activity.

* * *

H. A. SCHWARTZ, manager of research, National Malleable & Steel Castings Co., Cleveland, has been elected an alumni representative on the board of managers of his alma mater, Rose Polytechnic Institute.

* * *

A. M. YOUNGER has joined the technical sales staff of the Atlas Mineral

Products Co., Mertztown, Pa., and will be in charge in the Chicago area. He is a graduate of the University of Michigan and was formerly identified with the Chicago Flexible Tube Co.

* * *

JOHN STEENCKEN, formerly identified with the Wolverine Porcelain Enameling Co., has joined the Porcelain Enamel & Mfg. Co., Baltimore, as service representative. FREDERICK WOLTL, who was previously associated with the Chicago Vitreous Enamel Co., has become a member of the laboratory staff of the Baltimore company. SAMUEL L. HUDD, at one time factory manager of the Detroit Vapor Stove Co. and for the past several years an executive in the automotive industry, has been made sales engineer for the Ohio-Indiana territory for the Porcelain Enamel & Mfg. Co.

* * *

DAVID R. CALHOUN, who has been identified with the engineering department of the Wilkening Mfg. Co., Philadelphia, for the past several years, has been made manager of the company's industrial division. He received his engineering degree from Drexel Institute of Technology in 1934. WEBB PEDRICK has been promoted to the position in the engineering department heretofore held by Mr. Calhoun.

* * *

CARROLL H. HENKEL, metallurgist and chemical engineer, has recently joined the research staff of Battelle Memorial Institute, Columbus, Ohio, and has been assigned to the non-ferrous metallurgy division. He will be engaged largely in problems related to tin and its uses. He was formerly metallurgist with the Carnegie-Illinois Steel Corp. and previous to that was chemical engineer in the research laboratory of the American Sheet & Tin Plate Co.

* * *

C. C. LIMBOCKER has been elected chairman of the board of Wolverine Tube Co., Detroit, and H. J. HOOKS has been elected president. Mr. Limbocker has been president and Mr. Hooks has been secretary and treasurer for the past 20 years. G. R. ANTHONY has been named as vice-president and O. Z. KLOPSCH, vice-president and general manager. At the same time, J. B. COLYER was

named vice-president in charge of sales and B. D. HANNA was named secretary and treasurer.

❖ ❖ ❖

MARVIN W. DAVIS of Sheffield Gage Corp. has resigned as sales manager for this Dayton concern to become associated with HERMAN C. REYNOLDS, Sheffield's president, in the Detroit sales office of the company. Hereafter he will confine his activities to the Michigan territory.

❖ ❖ ❖

GEORGE E. CLIFFORD has been appointed vice-president in charge of sales of Spang, Chalfant, Inc., Pittsburgh, effective Aug. 1. Mr. Clifford is a native Pittsburgher and received his college training at the University of Pittsburgh. He has been with the



G. E. CLIFFORD.

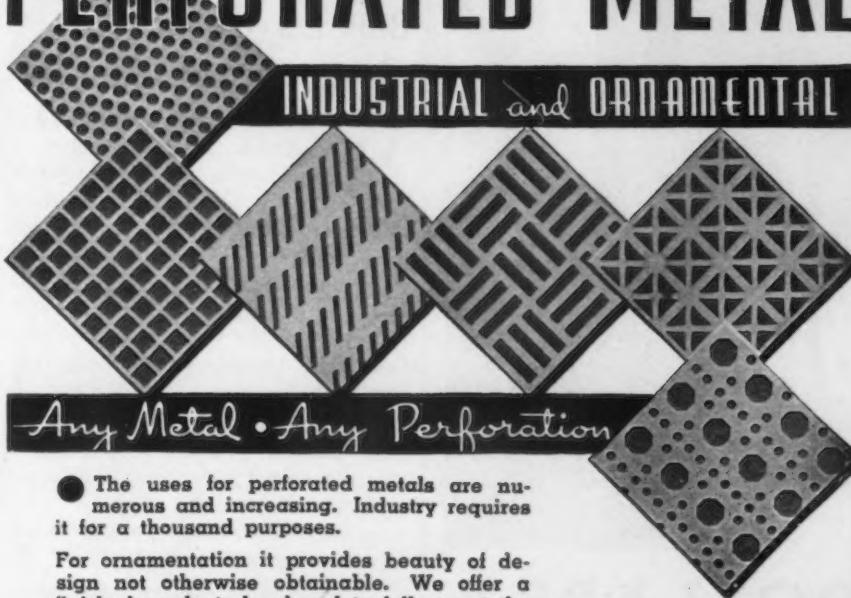
pipe division of Republic Steel Corp. since 1930, first in the capacity of assistant manager of pipe sales and later as district sales manager of the Los Angeles office. Previous to that time he was associated with the sales department of the A. M. Byers Co. for five years and with Atlas Powder Co. from 1919 to 1925. Mr. Clifford's headquarters will be in the general offices of the company in Pittsburgh.

❖ ❖ ❖

LINCOLN R. SCAFE, former manager of the Cleveland Fisher Body Division of General Motors, has joined the White Motor Co., Cleveland, as sales manager of the White Horse truck division.

PERFORATED METAL

INDUSTRIAL and ORNAMENTAL

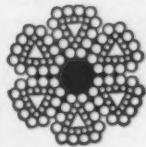


The uses for perforated metals are numerous and increasing. Industry requires it for a thousand purposes.

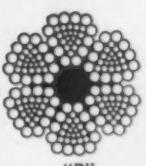
For ornamentation it provides beauty of design not otherwise obtainable. We offer a finished product, developed to fully meet the requirements you specify.

The Harrington & King Co.
PERFORATING

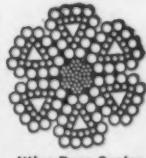
5657 FILLMORE STREET—CHICAGO, ILL.
New York Office, 114 Liberty Street



Style B
Flattened Strand



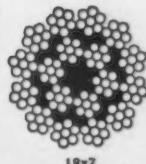
"B" Flattened Strand



Wire Rope Center



Steel Clad



18x7
Non-Rotating

You Can Depend On "HERCULES"** (Red-Strand) Wire Rope...

There is no guesswork when you use "HERCULES" (Red-Strand) Wire Rope. It is designed and built to do specific jobs better . . . safer . . . more economically. Furnished in a wide variety of constructions so as to be suitable for all purposes—each backed by 81 years of manufacturing experience and close co-operation with users.

—PREFORMED—

For maximum efficiency in Preformed Wire Rope, use Preformed "HERCULES". It is available in both Round Strand and Flattened Strand constructions.

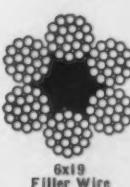
Made Only By

A. LESCHEN & SONS ROPE CO.

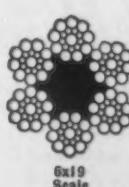
Established 1857

5909 KENNERLY AVENUE, ST. LOUIS, MO.

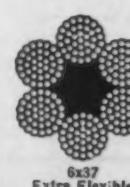
New York 90 West Street San Francisco . . . 520 Fourth Street
Chicago 810 W. Washington Blvd. Portland 914 N. W. 14th Avenue
Denver 1554 Wazee Street Seattle 2244 First Avenue South
* Reg. U. S. Pat. Off.



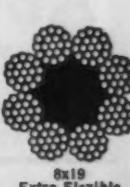
6x19
Filler Wire



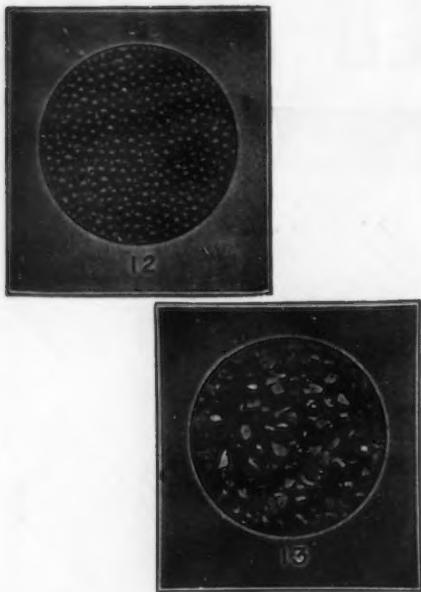
6x19
Scale



6x37
Extra Flexible



8x19
Extra Flexible



DOLLARS Saved Daily

Since the introduction of our
Heat-Treated Steel Shot
And
Heat-Treated Steel Grit

Consumers are saving

10 per cent
15 per cent
25 per cent

Metal blasting faster.

Metal blasting cheaper.

Metal blasting with a better
finish than ever before.

Our large, modern plant produces only heat-treated abrasives—uniform quality the year round.

A month's run of our shot or grit in your machine will prove the above statements.

Send us samples of the sizes you use; test our product in your own machine and save money.

A ton or a carload.

HARRISON ABRASIVE
Corporation

MANCHESTER, NEW HAMPSHIRE

We Never Compromise With Quality

Ships and Airplanes Bulk Largest in Government Contracts

WASHINGTON—Iron and steel contracts to the number of 1503, valued at \$71,934,844.60, were awarded within the scope of the Walsh - Healey Act since its effective date, Sept. 28, 1936, to June 30, 1939, and represented 7.19 per cent of total awards aggregating \$1,001,134,142.49 reported to the Division of Public Contracts, Department of Labor, according to Secretary of Labor Perkins.

Both in the number of contracts, 268, and in value, \$16,787,213.47, structural steel constituted the largest item in the iron and steel list while forgings and castings ranked second in value at \$15,939,570.27.

Transportation ranked first in the value of contracts awarded within the terms of the Walsh - Healey Act, with contracts aggregating \$329,165,217.55.

Machinery contracts, numbered 1435 and were valued at \$65,059,087.75 while contracts for non-ferrous metals and alloys numbered 426 and were valued at \$19,124,576.90.

The most important contracts under the transportation equipment classification were ships and equipment, valued at \$218,259,440.53. Ranking second in this group were aircraft awards which were valued at \$57,943,967.49. Engines, turbines, etc., valued at \$19,038,843.02, were the largest items in awards made under the machinery group while machine tools ranked second, awards for which were valued at \$10,334,701.25. In the non-ferrous and alloy groups, aluminum with awards valued at \$5,114,657.31, was the most important item while contracts for tin were valued at \$2,181,262.39 and for copper, \$2,134,250.12.

Miss Perkins announced that she

had approved 26 minimum wage recommendations of the Public Contracts Board which are now in effect. In the list she included wage recommendations for the iron and steel industry. Miss Perkins' statement must have been due to a mental lapse inasmuch as the iron and steel recommendations are now being held up by an injunction in the Circuit Court of Appeals in the District of Columbia. She said that nearly 15,000 employees have been reimbursed for overtime work or for non-payment of the minimum wage.

Miners Who Struck Ask Unemployment Compensation

BIRMINGHAM—The Department of Industrial Relations of the State of Alabama has filed an appeal in the State Circuit Court against the decision of the appeals board of the State Unemployment Compensation Commission awarding unemployment compensation to nearly 5000 coal miners of the Tennessee Coal, Iron & Railroad Co., which amounts to approximately \$400,000.

The case is the outgrowth of the coal mining holiday, and the board based its decision on the fact that the company had posted a shutdown notice on April 1. Miners of other companies were denied unemployment compensation because they had walked out.

Continental Steel Corp. reports for the three months ended June 30, 1939, net profit of \$253,128 after all charges and Federal taxes, equivalent after preferred dividends, to \$1.06 a share on the 200,561 shares of common stock outstanding. This compares with net of \$279,178, or \$1.18 a share, for the preceding quarter and with \$156,091 or 57c. a common share for the second quarter of 1938. For the six months ended June 30, net profits amounted to \$532,307, equivalent on the same basis to \$2.24 a common share, compared with \$211,300 or 63c. a common share earned on the same basis in the first half of last year. Net sales for the second quarter totaled \$3,678,005 compared with \$4,393,657 for the preceding quarter and with \$3,202,438 for the second quarter of 1938.

IRON AND STEEL CONTRACTS AWARDED WITHIN SCOPE OF WALSH-HEALEY ACT

Sept. 28, 1936-June 30, 1939

	Number of Contracts	Value	Per Cent of Grand Total
	1,503	\$71,934,844.60	7.19
Bolts, nuts, rivets, etc.	27	431,169.93	0.04
Fencing materials	22	342,911.20	0.03
Forgings and castings	160	15,939,570.27	1.60
Hardware, miscellaneous	41	687,008.62	0.07
Metal doors, sash and frames	32	1,345,915.97	0.13
Metal shingles and roofing	10	268,110.11	0.03
Pipe and fittings	182	5,357,259.97	0.54
Plumbing supplies	10	211,836.05	0.02
Rails, bars, posts, etc.	196	7,410,371.46	0.74
Sheets, plates, shapes, etc.	206	8,814,060.46	0.88
Stoves and ranges (excl. electric)	53	5,175,684.74	0.52
Structural steel	268	16,787,213.47	1.68
Tools (excl. machine tools)	48	1,009,053.95	0.10
Wire rope and cable	57	1,235,308.64	0.12
Miscellaneous	191	6,919,369.76	0.69

REINFORCING STEEL

ATLANTIC STATES AWARDS

1300 Tons, Holyoke, Mass., dike, to Concrete Steel Co., Boston, through D. O'Connell's Sons, Inc., Holyoke, Mass., contractor.
 650 Tons, Pittsburgh, Bedford housing project, to Bethlehem Steel Co., Bethlehem, Pa.
 250 Tons, New York, Southern Parkway, S-39-2, to Concrete Steel Co., Chicago.
 225 Tons, Pittsburgh, River Front Boulevard, No. 3, to Lind Co. through John F. Casey Co., contractor.
 215 Tons, Northampton, Mass., diversion canal to Bethlehem Steel Co., Bethlehem, Pa., through Kellogg Corp., Turners Falls, Mass., contractor.
 200 Tons, New York, William Howard Taft School, to Carroll-McCreary Co., Inc.
 115 Tons, Brooklyn, Shore Parkway, MS-39-14A, to Bethlehem Steel Co., Bethlehem, Pa.
 110 Tons, Cortland, N. Y., sewage treatment plant, to Bethlehem Steel Co., Bethlehem, Pa.
 100 Tons, Washington, jail, superstructure, to Bethlehem Steel Co., Bethlehem, Pa.

CENTRAL AND WESTERN STATES

1000 Tons, Panama Canal, Schedule 3492; to Bethlehem Steel Co., Bethlehem, Pa.
 800 Tons, Chicago, grain elevator; 600 tons to Inland Steel Co., Chicago, and 200 tons to Truscon Steel Co., Youngstown.
 625 Tons, Richmond, Va., municipal warehouses, to Virginia Steel Co., Richmond.
 500 Tons, Chicago, soy bean elevator, Glidden Co., to Truscon Steel Co., Youngstown, through McDonald Engineering Co., contractor.
 492 Tons, Chicago, northwest side armory, to Bethlehem Steel Co., Bethlehem, Pa.
 270 Tons, Great Falls, Mont., civic center, to Paper-Calmenson Co., St. Paul, Minn.
 130 Tons, Cleveland, Halle Brothers garage, to City Iron Works.
 125 Tons, Chicago, two-story office building, to Bethlehem Steel Co., Bethlehem, Pa.
 113 Tons, Cleveland, Kentucky elementary school, to Truscon Steel Co., Youngstown.

PENDING REINFORCING BAR PROJECTS

ATLANTIC STATES

2500 Tons, Dorchester, Mass., housing project.
 2400 Tons, Charlestown, Mass., housing project (previously reported 1500 tons).
 300 Tons, Philadelphia, Tasker housing project; George A. Fuller, Philadelphia, low on base bid.
 554 Tons, Bedford County, Pa., section 13E, Pennsylvania Turnpike Commission; bids July 19.
 450 Tons, Buffalo, building, Pillsbury Flour Co.
 350 Tons, Fairfield-Trumbull, Conn., mesh, State road.
 250 Tons, Bangor, Me., two schools (previously reported 125 tons).
 100 Tons, Greenfield, Mass., Greenfield Tap & Die Corp. plant addition.
 100 Tons, South Windsor, Conn., mesh, State road.
 100 Tons, Stratford-Bridgeport, Conn., two State bridges.

CENTRAL AND WESTERN STATES

3650 Tons, Chicago, section S-6, subway; new bids asked July 20, original low bidder John Griffiths & Son Co., Chicago.
 2650 Tons, Chicago, section D-1, subway; bids July 27.
 1450 Tons, Chicago, addition, Montgomery Ward & Co.
 950 Tons, Chicago, section S-4B, subway; new bids asked; Herlihy M'd-Continent Co., Chicago, original low bidder.
 350 Tons, Winnetka, Ill., grade separation, cont. No. 8.
 300 Tons, East Peoria, Ill., Central Illinois Public Service Co.

Republic Steel Earns \$1,083,311 in First Half

CONSOLIDATED net profit of Republic Steel Corp., and subsidiaries for the second quarter of 1939, after deduction of all charges, amounted to \$550,412. This compares with a net loss of \$2,856,317 in the second quarter of 1938. Republic's earnings for the first half of 1939 were \$1,083,311.

"You'll live longer—



if you let **DUNBAR** design your springs and make them, too!"
BROS. COMPANY

DIVISION OF ASSOCIATED SPRING CORPORATION

BRISTOL, CONNECTICUT
Quality Springs since 1845



CONTINENTAL
 CONTINENTAL STEEL CORPORATION

KOKOMO, INDIANA

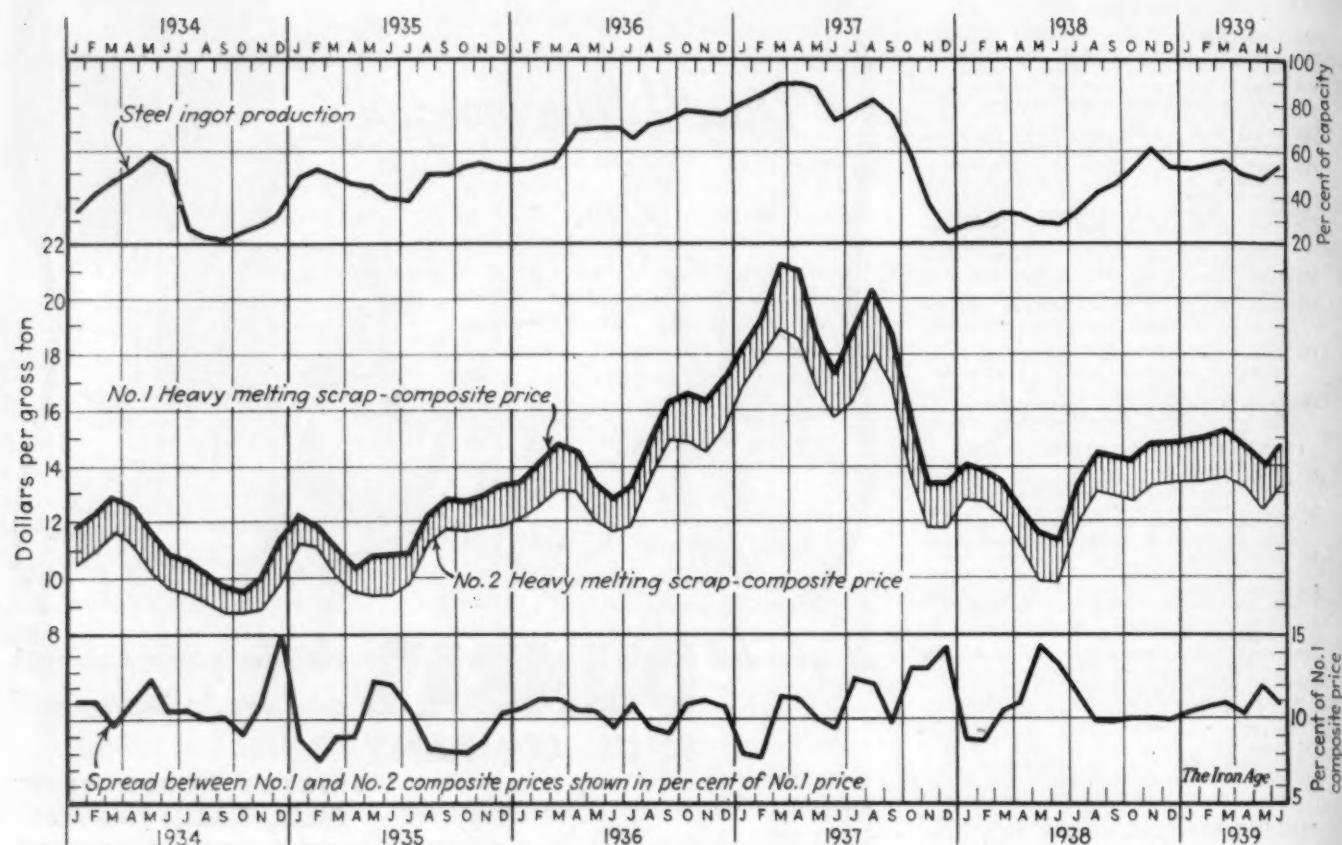
Plants at Kokomo, Indianapolis, Canton

OPEN HEARTH STEEL

WIRE • Bright Basic, Annealed, KONIK, Special Manufacturers, Nails, Barb Wire, Fence.

SHEETS • Black, Galvanized, Roofing and Siding.

No. 1 and No. 2 Scrap Composite Price



Price Relationship of No. 1 and No. 2 Scrap Shows Little Change in Past Five Years

THE IRON AGE composite price of No. 1 heavy melting steel scrap has long been considered a reliable barometer of general business conditions. The steady expansion

of light steel consumption, however, has greatly increased the volume of business being done in No. 2 scrap. In 1928 40 per cent of annual scrap turnover was in No. 2 steel; today

this grade accounts for from 60 to 65 per cent. This development has inspired several scrap authorities to suggest that greater consideration be given to No. 2 scrap in compiling

A FIVE YEAR COMPARISON OF NO. 1 AND NO. 2 SCRAP PRICES

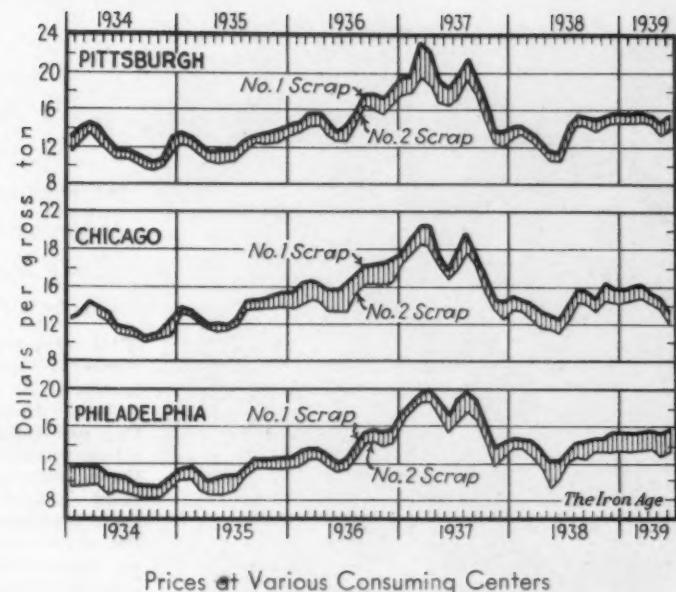
	1934			1935			1936			1937			1938			1939		
	No. 1 Scrap	No. 2 Scrap	Per Cent of Scrap No. 1 ²	No. 1 Scrap	No. 2 Scrap	Per Cent of Scrap No. 1 ²	No. 1 Scrap	No. 2 Scrap	Per Cent of Scrap No. 1 ²	No. 1 Scrap	No. 2 Scrap	Per Cent of Scrap No. 1 ²	No. 1 Scrap	No. 2 Scrap	Per Cent of Scrap No. 1 ²	No. 1 Scrap	No. 2 Scrap	Per Cent of Scrap No. 1 ²
Jan.	\$11.73	\$10.48 ¹	89.3	\$12.29	\$11.21	91.2	\$13.47	\$12.06	89.5	\$18.33	\$16.87	92.0	\$14.00	\$12.75	91.1	\$14.94	\$13.40	89.7
Feb.	12.25	10.94 ¹	89.3	11.98	11.06	92.3	14.12	12.56	89.0	19.27	17.79	92.3	13.86	12.65	91.3	15.01	13.42	89.4
March	12.82	11.60 ¹	90.5	11.06	10.06	91.0	14.75	13.12	88.9	21.25	18.79	89.0	13.46	12.05	89.5	15.20	13.58	89.3
April	12.54	11.19	89.2	10.46	9.52	91.0	14.59	13.08	89.7	21.02	18.69	88.4	12.40	11.04	89.0	14.77	13.27	89.8
May	11.57	10.17	87.9	10.70	9.42	88.0	13.39	12.00	89.6	18.54	16.71	90.1	11.54	9.94	86.1	14.17	12.50	88.2
June	10.67	9.58	89.8	10.74	9.48	88.3	12.81	11.59	90.5	17.28	15.67	90.7	11.32	9.86	87.1	14.71	13.11	89.1
July	10.55	9.45	89.7	10.96	9.83	89.7	13.29	11.87	89.3	18.79	16.52	87.9	13.29	11.79	88.7			
Aug.	10.15	9.15	90.1	12.25	11.23	91.7	15.04	13.63	90.6	20.43	18.03	88.3	14.51	13.10	90.3			
Sept.	9.63	8.67	90.0	12.70	11.68	91.9	16.45	14.96	90.9	18.73	16.83	90.0	14.34	12.95	90.3			
Oct.	9.54	8.67	90.9	12.67	11.64	91.9	16.63	14.83	89.2	15.89	13.88	87.3	14.21	12.79	90.0			
Nov.	10.04	8.96	89.2	12.90	11.77	91.2	16.31	14.52	89.0	13.34	11.66	87.4	14.74	13.27	90.0			
Dec.	11.43	9.77	85.5	13.33	11.96	89.7	17.10	15.28	89.4	13.46	11.67	86.7	14.88	13.42	90.2			
Aver.	11.07	9.89	89.3	11.85	10.74	90.6	14.83	13.29	89.6	18.03	16.09	89.2	13.54	12.13	89.5	14.80 ³	13.21 ³	89.3 ³

¹ Based on average of Philadelphia and Pittsburgh quotations only. Chicago prices not available previous to April, 1934.

² Per cent of No. 1 price equalled by No. 2 price.

³ Six-month average.

composite prices. With this thought in mind, THE IRON AGE presents herewith for the first time, data covering the price of No. 2 scrap over the past five years. The No. 2 composite price is based on the same consuming centers as the No. 1 composite, i.e., Philadelphia, Chicago and Pittsburgh. In the absence of a No. 2 grade in the Chicago market, alloy free automobile heavy melting, a comparable type, has been used. Prices on this grade are not available prior to April, 1934. While the relationship between No. 1 and No. 2 scrap is subject to occasional short-lived changes, as the table below shows, on the whole a fairly consistent spread is maintained. It is of interest to note that though the average price in the first six months of the present year was considerably higher than the average for 1934, the percentage relationship was identical. In the graph above the lower curve is intended to show the savings, on a percentage basis, that would have re-



Prices at Various Consuming Centers

sulted at a given time had No. 2 steel been purchased in place of No. 1. All

quotations are based on prices published in THE IRON AGE.

Financial Report Is Simplified and Illustrated For Employees' Benefit

THE simplification of financial reports so that employees who are not versed in such matters may read them understandingly has been carried out successfully by a number of large industrial corporations. The Standard Oil Co. of New Jersey, however, has carried this trend a step further and has illustrated its financial report to employees with appropriate drawings in cartoon style so that the reader may more readily visualize the points that are made.

In ABC fashion the company's income and outgo are discussed in detail. Of particular interest is the discussion of "What is Surplus?" as the Federal Government has until recently taken the position in its taxing program that the building up of a surplus by a corporation is an iniquitous practice that should be curbed. In the following simple manner, the Standard Oil Co. of New Jersey explains its surplus:

"At the end of 1938 Standard Oil Co. (N. J.) and its subsidiaries had a consolidated earned surplus of 475 million dollars that had been built up over a period of years. Isn't this a lot of money? Is the company hoarding it, and if so, why?

A substantial surplus is a vital necessity in the operations of a company working a natural resource into products which may not be sold for a

long time. There is so much misunderstanding about this subject that it is worth while discussing it.

"Let us compare our situation with that of a young married couple. As the years go on they are able to purchase a refrigerator, a radio, a car and perhaps a few shares of stock. Let us assume all these possessions are worth \$5000. But there are still some installments to be paid on the car, there are doctor bills and other amounts to be paid, totalling say, \$1000. The difference is \$4000 and that is their surplus.

"Does that mean that if the husband loses his job they have \$4000 on which to live? Not at all. Only a small part of that may be cash. To turn the rest into cash they would have to sell their car, radio, refrigerator—many of the things that contributed to their way of living.

"The company's surplus likewise consists only partly of cash. It, too, has invested a part of its earnings, and so, in the main, its surplus is made up of refineries, tankers, pipe lines, office furniture, cash for payrolls and current expenses in many parts of the world, crude oil and products in storage, trucks, barrels, etc."

Horst Mfg. Co., Detroit, has moved from 17005 Fullerton Avenue to a new location at 13639 Elmira Avenue where it has approximately 9000 sq. ft., tripling its former floor space. Company does production machining for automobile industry and manufactures universal joints for truck dump bodies.

Chain Belt Stockholders Approve Merger

MILWAUKEE—Stockholders of the Chain Belt Co., Milwaukee, have approved the acquisition of the Baldwin-Duckworth Chain Corp., Springfield, Mass., a concern with assets of about \$2,000,000.

It was also voted by stockholders to amend the Chain Belt's articles of incorporation to increase the authorized capital stock from 360,000 to 510,000 shares to make the acquisition of the Eastern concern possible. Chain Belt is acquiring the business and net assets by issuing to the Baldwin-Duckworth concern 139,537 shares of stock. No cash is involved in the transaction.

Baldwin-Duckworth plants are located favorable for distribution of the Chain Belt products in the East and gives the local company the advantage of maintaining inventories and service in that part of the country. There is practically no duplication between the products manufactured by the two companies.

Lukens Steel Licensed To Produce Ledloy

LUKENS STEEL CO., Coatesville, Pa., has been licensed to produce lead-bearing steels under the Inland Steel Co.'s Ledloy patents.

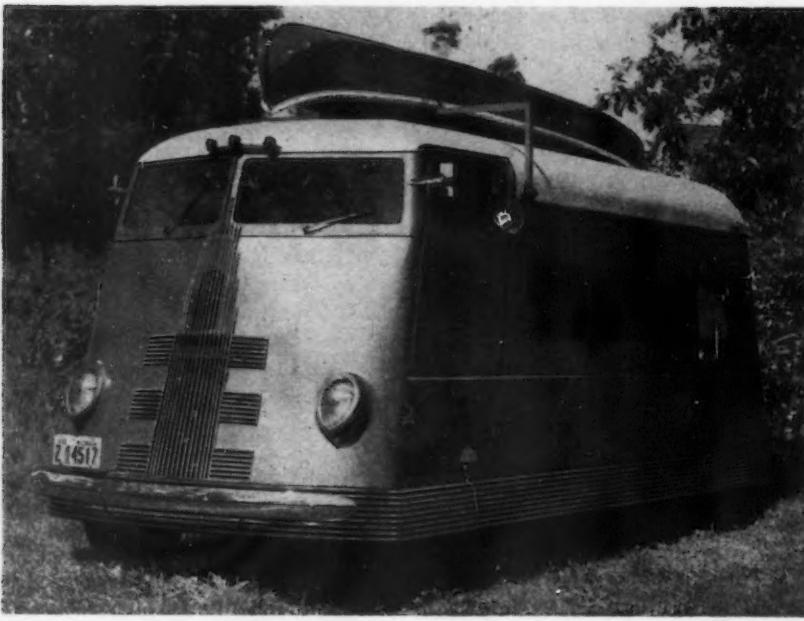


• • •
**International
Harvester
Co.'s New
Tractor**

THE newest addition to the tractor line of the International Harvester Co., and the smallest tractor made by the company, is pictured here. A detailed description of this new machine was published in last week's issue of THE IRON AGE.

• • •

THE Stout Club Car is a "stout fellow" on the highway for commercial travelers and vacationists. Probably a score or more firms use trailers as traveling sales offices and display rooms—many of them in the metal goods field—but they are handicapped in towing and parking the trailer, particularly in big cities. William B. Stout, noted engineer and designer, created this new type vehicle which has a shorter overall length than most of the larger sedans but has a 150 in. wheel base to improve ride. The vehicle is frameless (no conventional chassis) and the body structure is framed with U-shaped steel members, spot welded together to form a closed rectangular section. Supplementary structure is of seamless steel tubing. The car weighs 4,200 lb.; is powered by a Ford V-8 engine, mounted in the rear; is capable of 75 miles per hr. Wheels are independently sprung, with pneumatic suspension units. As equipped, the model car has four studio couches, table and separate chairs. Without interior equipment the car will sell for \$2000.



This Week on the Assembly Line

(CONTINUED FROM PAGE 58)

low alloy products so much that it has really effected savings for the automobile industry.

At the same time, for certain automotive applications, particularly in the bus, truck and tractor fields, the more complex and expensive alloys more than pay their way and are in increasing demand. There are even possibilities that these higher priced alloys will regain their old position in the passenger car field some day as higher driving speeds and greater performance are demanded from cars which each year are reduced in weight. This moving picture of science and industry is well worth watching.

Murray Corp. Diversifiers

Announcement of the entry of The Murray Corp. of America into the manufacture and sale of a diversified line of products was made here last Friday by C. W. Avery, president of the corporation.

An automatic electric stoker of radically new design was announced by the Murray Corp. at the same time.

The manufacture of automobile bodies, stampings and other products for automobile manufacturers has been almost the sole concern of Murray for 30 years, but in recent years most of this volume of business has disappeared as automobile companies opened their own body plants.

The new stoker is new in design, construction, method of operation and price. It weighs about one-third as much as most stokers; will burn coke, hard or soft coal, and is portable. The corporation's first selling activities relating to the new stoker will be centered in Detroit and vicinity with rapid expansion to a nation-wide scale being planned for the ensuing months.

In construction, the stoker consists mostly of stampings. It is mounted on three casters and can be wheeled from the fuel bin to the furnace to be put into operation. It is equipped with a 1/6 hp. horizontally mounted electric motor operating on 110 volts, 60 cycles, a.c.

The stoker is a pusher type with a self-lubricated gear reduction to a sprocket and heavy endless chain. The switch is a mercury tube, mechanically operated type, with automatic fuel control. The stoker fits all types of present furnaces and boilers and is installed by merely opening the door of the furnace and shoving the feed end

of the stoker into the opening. Fuel supply is regulated by the automatic fuel control while room temperature is regulated by thermostat and damper control. The price, installed, at Detroit is \$139.50.

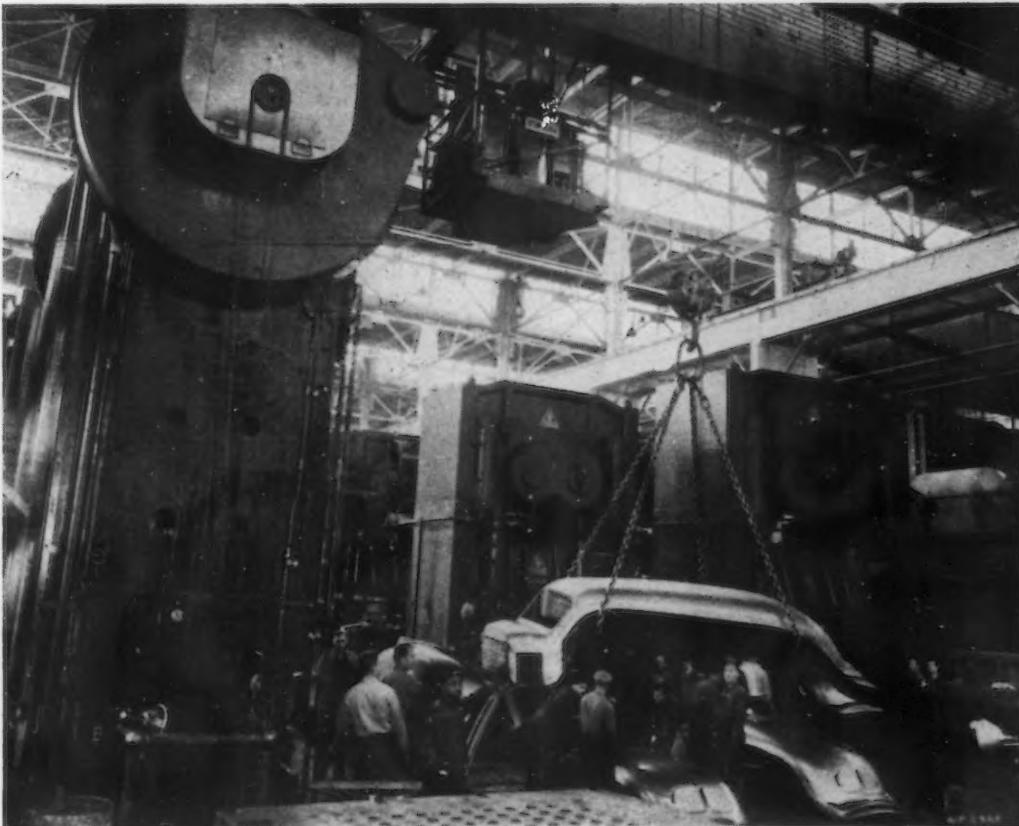
A formula for the settlement of the General Motors tool and die strike appeared to have been reached early this week as negotiations between the corporation and UAW-CIO officials continued at the General Motors building in Detroit. James F. Dewey, Federal labor conciliator, indicated that settlement of the strike "ought not to take many more hours—or days."

Although the strike of skilled workers was called to obtain a supplementary agreement to the union's contract, discussion seemed to have centered on the question of wage increases of 10c. per hr. for skilled workers. The union had also broached the subject of spreading the corporation's tool and die program over a longer period each year. By Monday night all union proposals had been discussed and the corporation was preparing to give its answer to the union on Tuesday.

AMONG the most successful applications of the newer surface treatments for bearing areas or others subjected to friction is this one at Hudson Motor Car Co. This is the granodizing bath setup for the Hudson camshaft. The installation is of the dip type, with parts immersed long enough for a reaction which forms a thin surface layer, somewhat abrasive, which eliminates the usual risk of harmful effects in the break-in period, according to Hudson engineers.



THE largest parts of the modern automobile are the steel one-piece tops. Plymouth makes probably the longest of such stampings — those for the seven passenger Plymouth sedan, which are formed in an unbroken section all the way from the trunk to the cowl in front. It is estimated that nine miles of steel an hour—a strip 6 ft. wide—moves through the working sections of the 3,000,000 lb. presses used in the stamping operation.



Current Metal Working Activity

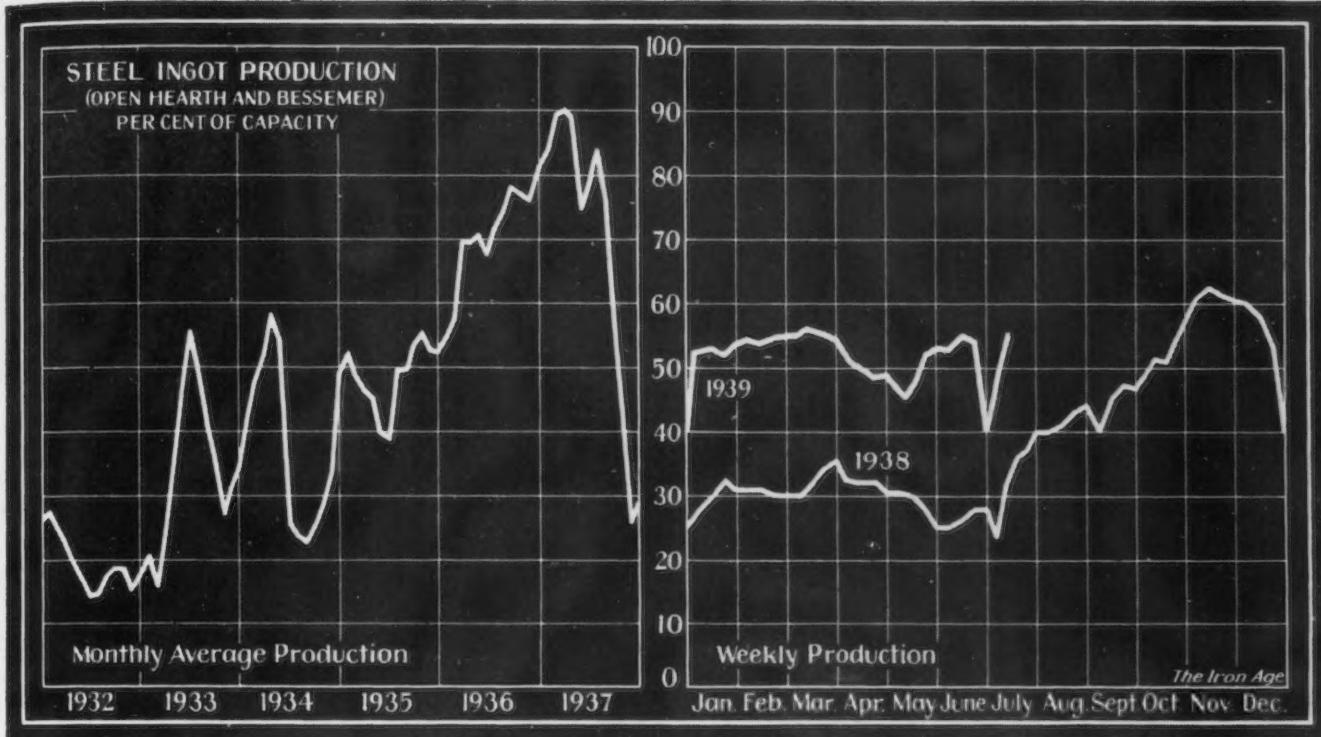
Latest Data Assembled by THE IRON AGE from Recognized Sources

	June 1939	May 1939	April 1939	May 1938	Five Months 1939	Five Months 1938
Steel Ingots: (gross tons)						
Monthly output ^a	3,130,381	2,917,876	2,986,985	1,800,877	15,499,546	9,155,740
Average weekly output ^a	729,693	658,663	696,267	406,519	718,236	424,270
Per cent of capacity ^a	53.44	48.24	50.99	30.30	52.60	31.07
Pig Iron: (gross tons)						
Monthly output ^b	2,118,451	1,717,516	2,056,177	1,255,024	10,403,918	6,811,005
Raw Materials:						
Coke output ^c (net tons)	2,421,235	2,934,560	2,339,321	15,456,042	13,091,316	
Lake Ore consumed ^d (gross tons)	2,245,513	2,799,769	1,711,146	14,141,219	9,244,627	
Castings: (net tons)						
Malleable, orders ^e	27,702	29,183	17,564	164,221	94,477	
Steel, orders ^e	41,660	34,100	20,636	189,511	130,651	
Finished Steel: (net tons)						
Trackwork shipments ^a	6,832	6,658	6,819	2,959	27,117	18,080
Fabricated shape orders ^f	156,207	117,549	77,322	553,252	390,201	
Fabricated plate orders ^f	34,036	35,844	25,141	143,078	126,400	
U. S. Steel Corp. shipments ^g	733,433	723,165	701,459	465,081	3,659,833	2,532,297
Fabricated Products:						
Automobile production ^h	321,000*	296,000*	359,200	210,174	1,678,927*	1,116,633
Steel furniture orders ^e	\$1,780,024	\$1,619,218	\$1,290,469	.....	.....	\$8,199,113
Steel boiler orders ^e (sq. ft.)	877,117	764,996	733,678	4,206,754	2,884,516	
Locomotives ordered ⁱ	51	19	5	144	44	
Freight cars ordered ⁱ	2,051	2,695	6,114	7,753	6,933	
Machine tool index ^j	211.6	219.8	155.6	66.7	186.9†	88.0†
Foundry equipment index ^k	108.8	146.0	90.6	133.9†	94.9†	
Non-Ferrous Metals: (net tons, U. S. only)						
Lead shipments ^l	40,124	37,903	25,098	193,508	147,160	
Lead stocks ^l	129,270	123,394	164,636	.....	.....
Zinc shipments ^m	37,284	39,354	40,641	24,628	208,006	125,990
Zinc stocks ^m	135,241	126,769	130,380	148,120	.....	.....
Tin deliveries ⁿ (gross tons)	4,925	5,905	5,980	4,275	25,075	22,545
Refined copper deliveries ^o	63,862	63,862	46,667	33,154	266,726	183,588
Refined copper stocks ^o	335,012	337,155	332,513	369,809	.....	.....
Exports: (gross tons)						
Total iron and steel ^p	532,641	394,008	540,628	2,123,371	2,603,644	
All rolled and finished steel ^p	125,545	134,478	109,448	623,505	617,154	
Semi-finished steel ^p	9,537	8,849	17,596	57,785	132,510	
Scrap ^p	382,642	237,691	371,745	1,378,694	1,624,795	
Imports: (gross tons)						
Total iron and steel ^p	28,142	44,083	20,814	144,407	103,098	
Pig iron ^p	3,219	3,512	1,795	11,578	19,465	
All rolled and finished steel ^p	13,908	32,587	15,691	89,361	68,644	
British Production: (gross tons)						
Pig iron ^q	717,700	692,100	608,900	633,900	2,921,000	3,463,900
Steel ingots ^q	1,175,600	1,218,100	1,058,200	957,000	5,230,000	5,149,800

† Three months' average. * Preliminary.

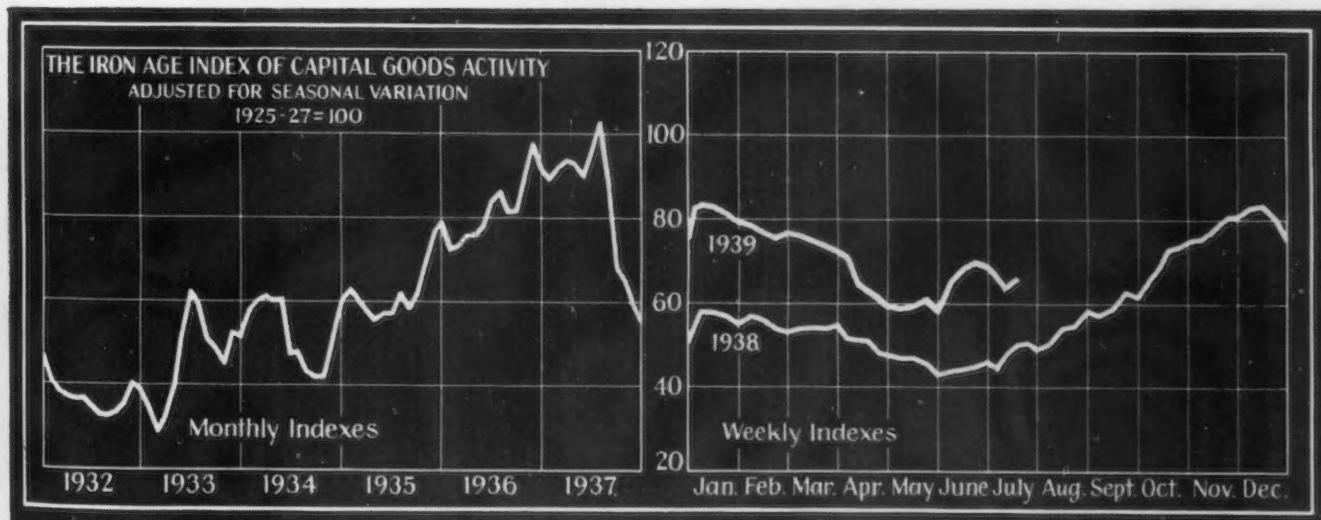
Source of data: ^a American Iron and Steel Institute; ^b THE IRON AGE; ^c Bureau of Mines; ^d Lake Superior Iron Ore Association; ^e Bureau of the Census; ^f American Institute of Steel Construction; ^g United States Steel Corp.; ^h Preliminary figures from Ward's Automotive Reports—Final figures from Bureau of the Census, U. S. and Canada; ⁱ Railway Age; ^j National Machine Tool Builders Association; ^k Foundry Equipment Manufacturers Association; ^l American Bureau of Metal Statistics; ^m American Zinc Institute; ⁿ New York Commodity Exchange; ^o Copper Institute; ^p Department of Commerce; ^q British Iron and Steel Federation.

Ingot Production Jumps Six and a Half Points to 56½%



District Ingot Production, Per Cent of Capacity	Pittsburgh	Chicago	Valleys	Philadelphia	Cleveland	Buffalo	Wheeling	Detroit	Southern	S. Ohio River	Western	St. Louis	East. Penn.	Aggregate
CURRENT WEEK	49.0	54.0	54.0	41.0	52.0	46.5	77.0	62.0	75.0	34.0	57.0	49.5	45.0	56.5
PREVIOUS WEEK	45.0	50.0	52.0	38.0	24.0	36.5	77.0	62.0	75.0	34.0	57.0	49.5	30.0	50.0

Index Recovers Part of Holiday Loss



APARTIAL recovery in steel and automobile production from the holiday dip was the chief cause of a rise of 2.2 points to 64.1 in THE IRON AGE index of capital goods activity for the week ended July 15. The week's advance represents only a third of the holiday drop, leaving the index still 4.4 points below the pre-holiday level. In no case has any component of the index completely regained the ground lost during the July 4th week. As the Pittsburgh and lumber carloading series lag one week behind the other factors of the index, they are only now showing the effects of the holiday. The decline in lumber carloadings in that week were a little sharper than

usual, while in Pittsburgh the declines were less than seasonal, raising the adjusted index slightly.

	Week Ended July 15	Week Ended July 8	Comparable Week
Steel ingot production ¹	73.9	61.0	1938 1929
Automobile production ²	59.5	48.7	45.8 141.4
Construction contracts ³	68.4	70.3	42.5 127.3
Forest products carloadings ⁴	49.2	60.6	59.6 119.2
Production and shipments, Pittsburgh District ⁵	69.3	69.1	47.5 124.8
Combined index	64.1	61.9	45.8 130.9
			48.2 128.8

Sources: 1. THE IRON AGE; 2. Ward's Automotive Reports; 3. Engineering News-Record; 4. Association of American Railroads; 5. University of Pittsburgh.

SUMMARY OF THE WEEK

... Ingot production at 56½ per cent, highest of year thus far.

... Further improvement seen when auto makers come into market.

... Nearly all products share in sales gains; steel scrap higher.

ARISE of six and a half points in ingot production to 56½ per cent this week brings steel operations to the highest level of the year thus far and half a point above the previous peak of 56 per cent in the second week of March. The next important forward movement probably will come in August when specifications from the automobile industry for 1940 models will be in larger volume. It is believed that the rate at that time may go to 60 per cent or higher for at least a brief period.

Despite the strikes of tool and die makers which have held back preparations for new models by General Motors, there has been a slight gain in automotive specifications. Although Packard will be the first motor company to complete its new cars, Ford Motor Co. is the first to inquire for a sizable tonnage of steel, having asked for prices this week on 75,000 tons.

New business and specifications against previous commitments have gained sharply in the past week over the preceding holiday week so that the month thus far compares favorably with the first half of June, which for many companies was the second best month of the year. One important company had a gain last week in its orders of about 45 per cent over the aggregate in the first week of the month. In the first half of July aggregate orders for some products have been 5 to 10 per cent over those of the like period last month. For the first time in several months some backlog tonnage is being accumulated.

THE strengthening of steel prices is believed to be partly responsible for improvement in orders. While concessions have not disappeared, particularly on shapes, plates and reinforcing bars, steel users are apparently becoming convinced that prices are not going lower and are buying with more confidence. Definite improvement has taken place in wire products and bolts and nuts, which were in a particularly bad price situation, and some sales of small tonnages of sheets have been made at the new prices which have nominally been

in effect since the May debacle. Extras on wire nails have been revised, with advances predominating.

With the automobile industry still not much of a factor and with the railroads closely restricting their purchases, the bulk of current steel business is coming largely from construction work, including shipbuilding, and miscellaneous industries. An increase in export sales has also occurred. With the exception of tin plate, which from now on may be a declining trend, and railroad track materials, nearly all steel products have shared in recent gains. Specifications for sheets and strip have improved, but indications are that most of the ordering out of low-priced commitments will come later from miscellaneous consumers as well as from the automobile industry.

A further increase in the demand for structural steel and other products used in construction work is probable during the next 30 or 60 days as the new Federal Works Agency proceeds with the PWA program, which on June 30 was 38 per cent complete. While Government-financed projects still constitute the bulk of construction steel awards and inquiries, steel companies and fabricators note with satisfaction that more private money is being expended than heretofore. Structural steel awards in the week were more than 19,000 tons, while new projects call for nearly 14,000 tons of shapes. Two sections of the Chicago subway on which bids are to be taken soon call for 22,500 tons of plates, while another section, on which the general contract may be awarded soon, requires about 25,000 tons of steel. Lettings of reinforcing bars total 7200 tons and new projects amount to nearly 16,000 tons.

DESPITE the slight decline in machine tool orders in June, buying this month has been heavy. The Ford Motor Co. has bought about \$750,000 worth of presses, the International Harvester Co. has expended well over \$500,000 for new tools for tractor manufacture on a program not yet completed, and \$200,000 or more will be spent for tooling a new airplane engine plant to be built in France. With Ford, International Harvester and Allis-Chalmers now competing in the low-priced tractor field, considerable stimulation of tractor manufacture is expected.

THE improved outlook for steel production has given additional strength to scrap markets, though not much consumer buying has taken place. Average quotations for No. 1 heavy melting steel have gained 25c. at Chicago, Pittsburgh and Philadelphia, advancing THE IRON AGE scrap composite price to \$15.04. From the low point of mid-May, this average has gained 96c.

A Comparison of Prices

Market Prices at Date, and One Week, One Month, and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Rails and Semi-finished Steel

	July 18, 1939	July 11, 1939	June 20, 1939	July 19, 1938
Per Gross Ton:				
Rails, heavy, at mill	\$40.00	\$40.00	\$40.00	\$42.50
Light rails: Pittsburgh, Chicago, Birmingham	40.00	40.00	40.00	43.00
Rerolling billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	34.00
Sheet bars: Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point	34.00	34.00	34.00	34.00
Slabs: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point	34.00	34.00	34.00	34.00
Forging billets: Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham	40.00	40.00	40.00	40.00
Wire rods: Nos. 4 and 5, Pittsburgh, Chicago, Cleveland	43.00	43.00	43.00	43.00
Skelp, grvd. steel: Pittsburgh, Chicago, Youngstown, Coatesville, Sparrows Point, cents per lb.	1.90	1.90	1.90	1.90

Finished Steel

	Cents Per Lb.:	2.15	2.15	2.15	2.25
Bars: Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham	2.15	2.15	2.15	2.25	
Plates: Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Clayton	**2.10	2.10	2.10	2.10	
Structural shapes: Pittsburgh, Chicago, Gary, Buffalo, Bethlehem, Birmingham	2.10	2.10	2.10	2.10	
Cold finished bars: Pittsburgh, Buffalo, Cleveland, Chicago, Gary	2.65	2.65	2.65	2.70	
Alloy bars: Pittsburgh, Chicago, Buffalo, Bethlehem, Canton or Massillon	2.70	2.70	2.70	2.80	
Hot rolled strip: Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown, Birmingham	2.00	2.00	2.00	2.15	
Cold rolled strip: Pittsburgh, Cleveland, Youngstown	2.80	2.80	2.80	2.95	
Sheets, galv., No. 24: Pittsburgh, Gary, Sparrows Point, Buffalo, Middletown, Youngstown, Birmingham	3.50	3.50	3.50	3.50	
Hot rolled sheets: Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown	2.00	2.00	2.00	2.15	
Cold rolled sheets: Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown	3.05	3.05	3.05	3.20	

**Subject to concessions in some districts.

On export business there are frequent variations from the above prices. Also in domestic business, there is at times a range of prices on various products, as shown in our detailed price tables.

The Iron Age Composite Prices

Finished Steel

July 18, 1939
One week ago
One month ago
One year ago

2.236c. a Lb.
• 2.236
2.236
2.300

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products represent 85 per cent of the United States output.

High

Low

1939	2.286c., Jan. 3	2.236c., May 16
1938	2.512c., May 17	2.211c., Oct. 18
1937	2.512c., Mar. 9	2.249c., Jan. 4
1936	2.249c., Dec. 28	2.016c., Mar. 10
1935	2.062c., Oct. 1	2.056c., Jan. 8
1934	2.118c., Apr. 24	1.945c., Jan. 2
1933	1.953c., Oct. 3	1.792c., May 2
1932	1.915c., Sept. 6	1.870c., Mar. 15
1931	1.981c., Jan. 13	1.883c., Dec. 29
1930	2.192c., Jan. 7	1.962c., Dec. 9
1929	2.223c., Apr. 2	2.192c., Oct. 29
1928	2.192c., Dec. 11	2.142c., July 10

Pig Iron

\$20.61 a Gross Ton
20.61
20.61
19.61

Based on average for basic iron at Valley furnace and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

High

Low

\$23.25, June 21	\$19.61, July 6
23.25, Mar. 9	20.25, Feb. 16
19.73, Nov. 24	18.73, Aug. 11
18.84, Nov. 5	17.83, May 14
17.90, May 1	16.90, Jan. 27
16.90, Dec. 5	13.56, Jan. 3
14.81, Jan. 5	13.56, Dec. 6
15.90, Jan. 6	14.79, Dec. 15
18.21, Jan. 7	15.90, Dec. 16
18.71, May 14	18.21, Dec. 17
18.59, Nov. 27	17.04, July 24

Steel Scrap

\$15.04 a Gross Ton
14.79
14.75
13.42

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

High

Low

\$15.29, Mar. 28	\$14.08, May 16
15.00, Nov. 22	11.00, June 7
21.92, Mar. 30	12.92, Nov. 10
17.75, Dec. 21	12.67, June 9
13.42, Dec. 10	10.33, Apr. 29
13.00, Mar. 13	9.50, Sept. 25
12.25, Aug. 8	6.75, Jan. 3
8.50, Jan. 12	6.43, July 5
11.33, Jan. 6	8.50, Dec. 29
15.00, Feb. 18	11.25, Dec. 9
17.58, Jan. 29	14.08, Dec. 3
16.50, Dec. 31	13.08, July 9

THIS WEEK'S MARKET NEWS

PRICES

... Strengthening of quotations continues . . . Nail extras revised

THE strengthening of steel prices is believed to be partly responsible for a better volume of orders. While all concessions have not disappeared, particularly on shapes, plates and reinforcing bars, buyers have at least become convinced that prices are not going lower and hence are placing orders with more confidence.

In line with the efforts of steel companies to strengthen prices wherever possible, nail extras have been completely revised, effective Aug. 1, the first revision of its kind in 12 years. Discrepancies have been eliminated and extras have been changed, some upward and some downward, in closer alignment with actual costs. A majority of the changes are upward.

Some mills have taken small sheet orders at the prices that are now in effect.

NEW BUSINESS

... Orders have increased in past week . . . Some mills ahead of June period

ORDERS for steel received by producers in the PITTSBURGH district have shown a sharp increase during the past week, with the lethargy of early July being shaken off. This improvement, which came chiefly in semi-finished steel, sheets and strip, and bars, occurred despite a continued lack of specifications from the automotive industry, which is hampered by strikes. One steel company here reports the past week the best in more than three months in total bookings. Signs that private money is coming out in greater volume are reported by steel sellers.

Aggregate new business of CLEVELAND and YOUNGSTOWN steel producers so far this month is running ahead of the comparable June period by 5 to 10 per cent. The continued brisk demand by varied industries, all material desired for immediate use, is contrary to most expectations and brings hopes that little or no slump will occur this summer.

Rural buying power promises to be

a bulwark toward sustaining demand. Another assisting factor is export orders and inquiries. Construction awards continue in fair volume. Railroad buying at CLEVELAND is headed by the Erie's order for 3777 gross tons of rails and by car repairs for the C. & O. Line pipe producers are counting upon the early receipt of several large tonnages.

Foundry coke shipments, ordinarily a good indicator of the melt, are running ahead of June at CLEVELAND.

The general firming up of steel prices is encouraging specifications, as buyers' fear of sudden weaknesses has been lessened. Orders for most steel products are being received in CHICAGO sales offices at a better rate than a month ago. Sheet mills are anticipating a considerable volume of releases from motor car makers throughout August and into the fall. Makers of sheets, strip, bars, shapes and plates will benefit from the small farm tractors being produced by Ford, International Harvester, and Allis-Chalmers. It is probable that orders for these tractors will reach their peak in the fall. Improved sales of farm implements also are expected.

The Chicago subway department will have another section ready for bids July 27. Known as D-1, this section will require 17,000 tons of heavy liner plates and rib beams for primary linings, 800 tons of lighter plates and beams, 2650 tons of reinforcing steel, 1850 tons of structural shapes, and 230 tons of cast iron pipe. The liner plates can be either steel or cast iron. On other sections steel liner plates have been used, but on D-1 some discussion has favored cast iron. In addition, new bids are being asked on section S-6, involving 3650 tons of reinforcing steel, 4700 tons of liner plates and 250 tons of structural shapes.

Ford Motor Co. is going into the market this week with an inquiry for approximately 75,000 tons of steel on the initial budget for 1940 model automobiles. There has been no indication yet as to when orders may be placed.

New business in PHILADELPHIA is following a mixed trend. Several sellers report a substantial spurt in business in the past 10 days, while others find the volume of new bookings shrinking. Outside of the shipyards

and the heavy construction industry, miscellaneous demand continues to be the chief source of current buying.

In NEW YORK orders received last week were generally in larger aggregate volume than in the preceding holiday week, the total for the month thus far comparing favorably with the volume during the first half of June.

STEEL OPERATIONS

... Ingot rate jumps six and a half points to 56½%, highest this year

INGOT production for the industry as a whole jumped six and a half points this week to 56½ per cent, the highest rate of the year thus far and half a point above the previous high of 56 per cent in the second week of March. Indications are that the next sizable increase in the rate may come next month when the automobile industry comes into the market with larger specifications.

Operations are higher in all major districts. The sharpest gain was in the CLEVELAND-LORAIN area, where the rate is up 28 points over last week to 52 per cent, approximately the level that prevailed in mid-June. The PITTSBURGH rate is up four points to 49 per cent, CHICAGO has also gained four points to 54 per cent, the YOUNGSTOWN district has risen two points to 54 per cent, EASTERN PENNSYLVANIA is three points higher at 41 per cent, BUFFALO is up 10 points to 46½ per cent.

PIG IRON

... Business has not improved much . . . Shipments are below June's

THE long-awaited period of heavier buying of pig iron has not yet arrived. Reports from some districts indicate that shipments have recovered somewhat from the dip in the holiday week.

According to sellers at CLEVELAND and YOUNGSTOWN, if general business remains as active as it is at present and if some of the export demand materializes, a more active market may develop. Among foreign inquiries are several of Scandinavian origin. Shipments from CLEVELAND furnaces

are off about 10 per cent from those of the same period in June. However, foundry coke shipments, ordinarily a good indicator of the melt, are edging ahead of the June rate.

Sales and production in the PITTSBURGH district are at a slightly higher level than before the holiday. As a consequence of improvement in the past 10 days, bookings by some producers for July to date may be estimated at about equal to those of the same June period. Buying is still hand-to-mouth.

New bookings at PHILADELPHIA are still confined to 50 and 100-ton lots, but shipments against old orders have improved steadily since the holiday shutdowns of foundries and at present are slightly above the pre-holiday level. The gain in deliveries there is largely due to a higher rate of activity in stove plants, pipe foundries and jobbing shops catering to shipyards.

In the CHICAGO territory shipments are at a slightly higher rate than a month ago, and, if the average holds up for the last half of July, the month will show an increase over June. In ST. LOUIS, also, shipments are above the early June rate, some foundries having stepped up production.

In the BIRMINGHAM district the market situation has improved a little. Steel company furnaces are quite well engaged. The Tennessee Coal, Iron & Railroad Co. now has all of its eight furnaces in blast, No. 6, at Ensley, having gone in on July 12. Republic Steel is operating three, Sloss-Sheffield two, and Woodward Iron two, a total of 15 in the district. A YOUNGSTOWN district stack is preparing to go in blast shortly.

STRUCTURAL STEEL

... Further increase in orders is expected in next 30 days

A FURTHER increase in the demand for structural steel during the next 30 days is considered likely. The PWA program was 38 per cent complete as of June 30 and steps are being taken to rush remaining projects. Although bookings of Government-financed projects are still a leading factor, steel producers and fabricators note a significant increase in the number of privately-financed jobs.

Awards of the week are headed by 4200 tons for an office building for the Lafayette Corp. in Washington, which went to the Fort Pitt Bridge Works. The Cedar Street bridge, YOUNGSTOWN, 1800 tons, was awarded to the Hunter Construction Co. For the

Columbus Road bridge in CLEVELAND the Wisconsin Bridge Co. will furnish 1320 tons. A viaduct in CINCINNATI, requiring 1280 tons, will be fabricated by the Fort Pitt Bridge Works. The Central High School, CLEVELAND, taking 1000 tons, was awarded to the Pittsburgh Bridge & Iron Co.

Among new projects of size are 1850 tons for the CHICAGO subway and 1000 tons for the Shore Parkway bridge, BROOKLYN.

Specifications covering the first of the 42 projects involved in the Long Island Railroad's \$10,000,000 grade crossing elimination program will be let shortly. The bulk of the work, which will require substantial quantities of structural and reinforcing steel, will be on the railroad's Rockaway Beach division.

MERCHANT BARS

... Spotty improvement seen ... Automotive orders awaited

HOT rolled bars, along with some other products, have shown a rather spotty improvement during the past few days, with shipments in July slowly pulling up on the June total. Delays due to strikes in the automotive industry continue to be a factor in the market and producers are hoping for an early settlement of union disputes to remove this obstacle to improved orders.

Orders entered during the first half of July at CLEVELAND were slightly in excess of the comparable June period. This is due more to the fact that some orders placed on June 30 were unavoidably delayed in being entered, because of the holiday, rather than to recent incoming tonnages.

CHICAGO area demand for bars in the first two weeks of July is somewhat better than a month ago, but this can be traced almost entirely to a few large customers who covered in advance at the 2.25c. base minus quantity discount of 15c. per 100 lb. General activity is little changed, but the prospects of automobile buying later in the month, extending into August and perhaps September, and renewed buying from makers of farm implements and tractors, are giving bar sellers considerable to anticipate.

Merchant bar demand is fairly active in PHILADELPHIA, with cold-finished demand from machine tool builders outstanding in the past week. Forgers, who have been chiefly occupied with Government work in the past, report an influx of private inquiries in the past 10 days.

REINFORCING BARS

... Inquiries for large tonnages feature the market

INQUIRIES for fairly large tonnages of reinforcing bars seem to assure a good rate of activity for some weeks to come. Among the outstanding new projects are 2500 tons for a housing project at Dorchester, Mass.; 2400 tons for a housing project at Charlestown, Mass. (previously reported as 1500 tons); 3650 tons for one section of the Chicago subway and 2650 tons for another and 1450 tons for an addition to Montgomery Ward & Co.'s building, CHICAGO.

The largest awards were 1300 tons for a dike at Holyoke, Mass., which went to the Concrete Steel Co., and 1000 tons for the Panama Canal, awarded to the Bethlehem Steel Co. A grain elevator in CHICAGO will take 800 tons, of which the Inland Steel Co. will furnish 600 tons and the Truscon Steel Co. 200 tons. The Bethlehem Steel Co. will furnish 650 tons for the Bedford housing project in PITTSBURGH.

RAILROAD BUYING

... Erie orders 3777 tons of rails, its second purchase this year

THE Erie Railroad has ordered 3777 gross tons of 131-lb. and 112-lb. rails, giving 3007 gross tons to Carnegie-Illinois Steel Corp. and 770 gross tons to Bethlehem Steel Co., the purchase gaining significance because it is Erie's second rail buy of the year.

The Chesapeake & Ohio recently completed plans for a car repair program estimated to involve about 1000 tons of steel. Among car builders specified are Pullman-Standard and Greenville Car Co.

Nickel Plate road is inquiring for 10 100-ton gondolas.

Edward G. Budd Mfg. Co. has received an order for two seven-car light-weight passenger trains from Atlantic Coast Line and an order for four light-weight passenger cars from Atchison, Topeka and Santa Fe. The Santa Fe also placed seven light-weight passenger cars with Pullman-Standard Car Mfg. Co. New York. Chicago & St. Louis is taking bids on 10 gondola cars.

Activity in the motive power field includes the purchase of two diesel-electric locomotives from Electro-Motive Corp. by Atlantic Coast Line, the

conversion of six locomotives from 2-10-2 type to 4-8-2 by Illinois Central, and the rebuilding of 10 locomotives by Great Northern in its own shops.

The Bureau of Reclamation, Denver, Colo., has asked for bids by July 20 on invitation 33282-A for 2253 tons of relaying rails and 250 tons of track accessories. The relaying rails are listed as follows: 533 tons of 90-lb. Class A, 1191 tons of 110-lb. Class A and 529 tons of 90-lb. Class B (guard rails).

BOLTS, NUTS AND RIVETS

... Volume is better and prices are firmer

PRODUCERS express gratification at the order volume received so far this month, well in excess of the comparable June period. Rural buying power in particular appears likely to be very good over the remainder of this year. In the opinion of several producers, prices currently are firmer than at any time in recent months.

SHEETS AND STRIP

... Specifications coming in more freely from miscellaneous industries

SPECIFICATIONS at PITTSBURGH from miscellaneous consumers of sheets and strips have been coming in at a somewhat faster rate than from the automotive industry which is embarrassed by strikes. In some cases parts makers have been forced to curtail steel shipments because die and tool makers are in difficulty. Such important users of flat rolled steel as the refrigerator manufacturers have, however, been specifying recently in greater volume. Some companies report a slight recovery in sheet and strip buying following the exceedingly slow business of the long holiday period. Steel producers expect the next sizable upturn in steel ingot production to gain momentum from heavier specifying against flat rolled contracts by the automotive plants.

No bulge is apparent in flat rolled markets at CLEVELAND and YOUNGSTOWN, but releases against blanket tonnages by miscellaneous consumers continue good. Galvanized prices are firmer, beneficial stimulus toward this end having accrued from strengthened wire prices. CLEVELAND and YOUNGSTOWN producers of sheet will enforce the plan of abolishing credits for ex-

cess weight over permissible tolerances upon strictly new business.

Discussions with CHICAGO sheet makers indicate that the new practice announced last week in THE IRON AGE, whereby mills will insist on orders specifying standard gage with tolerances plus or minus applying, will spread generally throughout the industry. One important mill in CHICAGO reported all new business was being accepted on this basis, and also some of the tonnages taken during the second quarter. Other mills had not yet heard of the new plan but favor it, and believe it will be adopted generally. Volume of incoming business and releases against commitments at CHICAGO has not changed greatly from last week, except for a slight improvement in automobile demand.

Sales in PHILADELPHIA are moving sidewise, showing little week-to-week variation, with demand from miscellaneous consumers still accounting for most of the current business. Several instances have been reported of further extensions being granted on recent low-price contracts, but the bulk of new business is apparently being done at published levels.

Sheet business during the past week moved up sharply in SOUTHERN OHIO to an average of approximately 60 to 65 per cent of mill capacity. Mill operators report that the slackening in demand during the preceding week was unquestionably the result of the holiday period and not the result of any diminution in the interest of consumers generally.

WIRE PRODUCTS

... Nail extras revised for first time in 12 years

ANNOUNCEMENT of extras amounting to increases of as much as \$2 a ton on nails and staples was made the past week by manufacturers of wire products. The extras, whose effect on finer gages is of chief interest to the trade, came in the first change of its kind since Dec. 1, 1927, and are to be effective Aug. 1. Sizes of nails ordinarily contributing a third or more of the tonnage are not affected, however, by the changes which will take account of increased costs in making certain classifications.

Some extras will be slightly reduced, a few will be unchanged and the majority will be slightly higher. The action is an attempt by producers to eliminate discrepancies and level off a number of charges which have been out of line with costs.

Aggregate incoming business for wire sellers at CLEVELAND is light, but books are comfortably filled.

Industrial wire buying is running ahead of demand for merchant wire products in the CHICAGO district, but both are considered by sellers there to be holding up well. The current emphasis on small tractors for the farm will have a favorable effect on wire tonnage.

PLATES

... 17,000 tons will be required for section of Chicago subway

ALTHOUGH price concessions have not yet disappeared in the plate market, a tendency toward a strengthening of quotations is apparent. Some mills have obtained orders at 2.10c., basing point, though on the larger jobs lower prices have been quoted.

Section D-1 of Chicago's subway will require about 17,000 tons of liner plates and rib beams for the primary lining, while for other parts of the section 800 tons of lighter plates and beams will be needed. Bids will be taken July 27.

On another section of the Chicago subway on which bids were taken in June, the general contract may be awarded soon by the Chicago City Council to S. A. Healy Co., the low bidder. In this section about 28,000 tons of liner plates will be required.

Demand for plates generally in the CHICAGO district is only fair. At CLEVELAND and YOUNGSTOWN plate tonnage received so far this month is slightly ahead of the corresponding June period.

Miscellaneous plate volume has picked up in the past week in the NEW YORK area. Tank builders are a little more active and there has been some buying on the part of shipyards, though the tonnages are relatively small.

Sales in PHILADELPHIA thus far in July have been holding up to the June level. Shipyard releases, though small in individual tonnages, have been a consistent contributor to rolling schedules, but carlot demand from miscellaneous sources is assuming important magnitude. Since the recent Reading purchase, which is now estimated to have involved at least 1400 tons, there has been no noteworthy buying by the railroads. Two 500-ton lots for South Africa have been booked lately, but general export inquiry is tapering. Bidding on 21,000 tons of plate for

Navy yard substantiates reports of firmer tendencies in prices over the past month. Although a few small parcels of this tonnage went at from 5c. to 11c. per 100 lb. below published levels, the bulk of the bids was on the 2.10c. basis.

Producers of tanks in St. Louis are operating at 75 per cent of capacity with orders principally from nearby Illinois oil fields.

SEMI-FINISHED STEEL

Production in Pittsburgh area slightly improved

SEMI-FINISHED steel production in the PITTSBURGH area is showing a slight improvement and for some producers will be higher this week than for any seven-day period in June. Releases from non-integrated mills making sheets and strip are somewhat better. Demand at CLEVELAND continues light, virtually unchanged from other recent weeks.

TUBULAR GOODS

Sales have gained slightly . . . Pipe line awards hoped for

SALES of tubular goods in the PITTSBURGH area gained slightly the past week, due chiefly to a narrow increase in demand for oil-country goods. Railroad buying is slightly better. Producers are awaiting the placing of several substantial line pipe awards and are hopeful that seasonal considerations soon will bring out some business on projects which cannot be delayed until cold weather.

At YOUNGSTOWN and LORAIN tubular mill schedules are very good this week. At CLEVELAND, standard pipe sales so far this month are reported to be greatly improved over the corresponding June period, although a special condition is partly responsible.

Oil country shipments to the mid-continent field and the Pacific Coast are holding up very well.

TIN PLATE

Operations at 64% expected to taper in next two months

OPERATIONS this week continue unchanged at 64 per cent, a somewhat stronger rate of activity than expected following heavy shipments in June to meet seasonal requirements of canners. A moderate decline in production over the next eight weeks is looked for.

PWA Program is 38% Completed

WASHINGTON—The new Federal Works Agency reported on Monday that the PWA construction program was 38 per cent completed in number of projects as of June 30 when it took over the duties of the old Public Works Administration. The PWA estimated late last month that the peak of construction will be reached by the end of July and that \$591,000,000 worth of iron and steel products had been purchased under the PWA program.

Paid out under the program since the first of the year is \$637,000,000, of which the Federal Government has contributed \$286,712,000 in outright grants, and cities, towns and municipalities, \$350,426,000 for 2318 projects.

The 2800 projects which had previously been approved by the PWA but held up because of lack of money are expected to be reviewed by the new works agency if the new spend-lend program calling for the construction of self-liquidating projects is approved.

The latest information, however, is that construction and employment

peaks are expected to be reached next month, at which time the program will be more than half complete.

CAST IRON PIPE

Lynn, Mass., has divided a tonnage of 6-in. class B pipe between Warren Foundry & Pipe Corp., Boston, and Donaldson Iron Co., Emmaus, Pa. Former's bid was 86½c. per ft. and the latter's 91½c.

Bloomingdale, N. J., plans pipe line extensions and replacements in water system. Cost about \$35,200.

East Brunswick, N. J., plans pipe line extensions in water system in Summerhill Road. Cost close to \$23,000. J. H. Weitzen, 290 George Street, New Brunswick, N. J., is consulting engineer.

Department of Public Works, Camden, N. J., Henry Magin, director, plans pipe line extensions in water system in Eleventh and Twelfth Wards. Financing will be arranged through Federal aid. Estimates of cost are being made.

Chagrin Falls, Ohio, plans pipe line extensions in water system and other waterworks improvements. Surveys and estimates of cost have been authorized. R. F. MacDowell, Chester-Twelfth Building, Cleveland, Ohio, is consulting engineer.

West Farmington, Ohio, plans pipe lines for water system and other waterworks installation, including 75,000-gal. elevated steel tank on 100-ft. tower. Cost about \$63,000. Financing is being arranged through Federal aid. Carl J. Simon & Associates, Van Wert, Ohio, are consulting engineers.

Appleton, Wis., Water Commission has awarded contract for 4, 6 and 8-in. pipe to Lynchburg, Va., Foundry Co. Lynchburg firm offered prices of 58c., 84c. and \$1.25 for 4, 6 and 8-in. pipe, respectively.

Metropolitan Utilities District, Eighteenth and Harney Streets, Omaha, Neb., Col. T. A. Leisen, general manager, plans about 22,300 ft. of 12-in. from city limits to Boys Town for water service at later place. Work is scheduled to begin in August.

Harris County Water Control District No. 2, Houston, Tex., E. R. Anderson, president, plans pipe lines for water system in Lindale Addition area. Bond issue of \$152,000 has been authorized for this and other waterworks installation in that territory.

Excelsior, Minn., closes bids July 25 for about 900 ft. of 6-in. pipe for extensions in water system. Druar & Milinowski, Globe Building, St. Paul, Minn., are consulting engineers.

Iowa Public Service Co., Sioux City, Iowa, plans pipe lines for water system at Castle Hill, Iowa, where franchise is being secured.

Constructing Quartermaster, McChord Field, Wash., asks bids until Aug. 4 for pipe for water system (Circular 6888-4).

Seattle, Wash., has awarded 900 tons for Warren Avenue city water main to United States Pipe & Foundry Co., San Francisco.

Santa Monica, Cal., has awarded 250 tons of 4, 8 and 12-in. pipe, class 250, to American Cast Iron Pipe Co., San Francisco.

Weekly Bookings of Construction Steel

	Week Ended			Year to Date		
	July 18, 1939	July 11, 1939	June 20, 1938	July 19, 1938	1939	1938
Fabricated structural steel awards . . .	19,150	7,950	23,300	7,800	561,575	373,030
Fabricated plate awards	355	625	1,275	3,485	94,335	75,105
Steel sheet piling awards	300	6,810	4,050	790	40,265	27,610
Reinforcing bar awards	7,220	6,575	8,000	19,800	270,715	158,425
Total Letting of Construction Steel . . .	27,025	21,960	36,625	31,875	966,890	634,170

IRON AND STEEL SCRAP

... Strength in most markets as ingot rate climbs ... Composite up 25c. to \$15.04.

JULY 18—Scrap markets are stronger throughout the country, although not much mill buying has taken place in the past week. Two sales of moderate tonnages of No. 1 heavy melting steel at \$16 at Philadelphia early this week has sent the average there up 25c. and a similar advance to the same level has taken place at Pittsburgh, although very little material has moved so far. The average is up 25c. at Chicago, based largely on broker transactions, the net result being an advance of 25c. in the composite figure, from \$14.79 to 15.04, close to the figure prevailing on April 11. A gain of almost \$1 has been made from the 1939 low of \$14.08, last recorded on May 23.

No new sales are reported at Cleveland and Youngstown, but shipments are heavy against commitments made the first week in July. The Buffalo market is stronger as a result of a sale of No. 2 steel to a local mill. Scrap movements in the Detroit area are slow, but the market undertone is strong. No buying is expected in the St. Louis district until after Aug. 1.

There has been some let-up in export shipments, although the export market continues to be a leading factor in eastern Pennsylvania.

Pittsburgh

The market for old metal shows spotty strength with little tonnage moving so far but with many signs pointing to an early price advance accompanying increases in the steel melting rate here and in other major steel producing districts. Buyers still are cautious, despite a feeling that demand is feeling its way toward higher levels. No. 1 heavy melting steel is now quotable at \$15.50 to \$16, an increase of 25c. which applies also to scrap rails, quoted at \$16.25 to \$16.75, compressed sheets, \$15.50 to \$16, and hand bundled sheets, \$14.50 to \$15. Railroad heavy melting is unchanged but cast iron carwheels and heavy steel axle turnings are up 50c. a ton.

Chicago

Heavy melting steel is quoted this week at \$13.50 to \$13.75, based on the ability of brokers to buy at the lower figure and mill sales at \$13.75. Many reports of a \$14 sale are floating about this district, but cannot be confirmed. Some dealers and brokers insist \$13.75 must be paid for steel, but others have not yet had to pay more than \$13.50, though for a large tonnage of No. 1, at least \$13.75 would apply. The market is stronger all along the line and general sentiment is very bullish.

Philadelphia

Quotations on both grades of heavy melting steel are up an average of 25c. per ton this week. Two moderate sized tonnages of No. 1 steel were sold early this week at \$16, while brokers continue to pay \$15.50 covering on old orders, making this grade now \$15.50 to \$16, as against a flat \$15.50 a week previous. Several sales into consumption of No. 2 steel at \$14, makes this item now quotable at \$13.50 to \$14, as compared with a flat \$13.50 in the preceding week. More interest has been shown in cast grades recently, and on the basis of recent mill sales heavy breakable cast is now quoted at \$15 to \$15.50, up 50c., and stove plate at a flat \$13, up an average of 25c. The improvement in melting operations, both nationally and in this district, together with continued strong export demands, has preserved the strong undertone that has characterized this market for the past several months.

Cleveland

Shipments are brisk this week to the two local steel producers who bought generously during the first week of July. Principal quotations are unchanged this week, the market retaining strength, while several other items are adjusted upward in line with dealers' buying prices and the recent railroad lists.

Youngstown

The market remains in a very strong position here, as around 46 open hearths are active this week in the district. Heavy demand at Cleveland has partly tightened up the situation but shipments are continuing against orders previously placed here. Dealers look for continued strengthening of the market, reaching a peak probably in the fall.

Buffalo

On the basis of a purchase of No. 2 heavy melting steel made last week by a consumer in the district at a price reported to be \$12 to \$12.50 the price of No. 1 heavy melting is up 50c. to \$13.50 to \$14. Another small sale of selected heavy melting steel raised the price of railroad heavy melting 50c. to \$14 to \$14.50. Cast scrap activity is light.

St. Louis

The scrap iron market is steady at unchanged prices. No deals with mills are pending, and no buying is expected until after Aug. 1, but the movement of scrap from the country is small, as are railroad lists. There also is some short interest by dealers. Railroad lists: Southern, 4000 tons; Gulf Coast Lines, 1400 tons, and Missouri-Kansas-Texas, 600 tons.

Cincinnati

A stronger undertone in the old materials market brought a trifle more extensive dealer activity during the past week. Trading for heavy melting grades was

noticeable in the current market, but except for heavy mixed cast, the cast grades were without exceptional activity. Mill buying is still desultory, but shipments against continuing commitments continue to be good. As the result of current activity, the market bids on all steel grades are up 25c.

Detroit

A strong undertone prevails in the Detroit market but iron and steel scrap movements are continuing dull with no change in prices apparent yet. One consumer has ordered a decrease in shipments of blast furnace scrap. On other materials there is no immediate indication of buying and it is understood that the rejection rate on current shipments is relatively high.

New York

The number of ships currently loading for export is somewhat less than the average that has prevailed in recent months, with indications that shipments both to the Orient and to Europe are slowing up. The Japanese have been out of the market since the latter part of May, but are expected to buy before the end of July. Further talk is heard in Washington of a possible embargo of scrap shipments to Japan, but it is unlikely that Japan would be singled out or that scrap itself would be singled out as contraband unless through specific neutrality legislation.

Schiavone Bonomo Corp., Jersey City, N. J., has been awarded the entire property and rolling stock of the Fort Smith & Western Railway by order of the Federal Court at Fort Smith, Ark. The property consists of 232 miles of main and side track, 11 locomotives, more than 145 freight and other cars, and machinery and equipment.

Boston

The American Steel & Wire Co., Worcester, has put out feelers on No. 1 heavy melting steel, but according to brokers here has not actually made purchases. Textile machinery makers have about completed stocking machinery and textile cast, having a sufficient supply on hand to carry through the remainder of 1939. Pennsylvania steel mills are doing practically nothing in this market, consequently prices are nominal. In contrast with the domestic market, the export continues active and strong. Approximately 16,000 tons of scrap have been shipped from Boston to Italy this month, and several thousand tons have gone to Japan. Shipments to England have been lacking of late, but are expected to increase before the close of July.

Toronto

In the Canadian scrap markets uncertainty as to supply and demand prevails, while prices remain unchanged. Consumers are in the market only to provide for immediate needs and no long term contracts have been booked by Ontario melters. One local dealer, however, has made a shipment of 3500 tons of heavy melting steel to Dominion Steel & Coal Corp., at Sydney, N. S., this being the largest single delivery made this year. Steel mills in the Hamilton district still are taking delivery against short term contracts and there is fair demand for heavy melting steel.

Iron and Steel Scrap Prices

PITTSBURGH

Per gross ton delivered to consumer:	
No. 1 hvy. mltng. steel.	\$15.50 to \$16.00
Railroad hvy. mltng.	16.25 to 16.75
No. 2 hvy. mltng. steel.	13.75 to 14.25
Scrap rails	16.25 to 16.75
Rails 3 ft. and under	17.50 to 18.00
Comp. sheet steel	15.50 to 16.00
Hand bundled sheets	14.50 to 15.00
Hvy. steel axle turn.	14.00 to 14.50
Machine shop turn.	9.00 to 9.50
Short shov. turn.	10.50 to 11.00
Mixed bor. & turn.	8.00 to 9.00
Cast iron borings	8.00 to 9.00
Cast iron carwheels	15.00 to 15.50
Hvy. breakable cast	12.50 to 13.00
No. 1 cupola cast	15.00 to 15.50
RR. knuckles & cplrs.	17.50 to 18.00
Rail coil & leaf springs	18.00 to 18.50
Rolled steel wheels	18.00 to 18.50
Low phos. billet crops	18.50 to 19.00
Low phos. punchings	17.50 to 18.00
Low phos. plate	16.00 to 17.00

PHILADELPHIA

Per gross ton delivered to consumer:	
No. 1 hvy. mltng. steel.	\$15.50 to \$16.00
No. 2 hvy. mltng. steel.	13.50 to 14.00
Hydraulic bund., new	15.00 to 15.50
Hydraulic bund., old	11.50 to 12.00
Steel rails for rolling	17.00 to 17.50
Cast iron carwheels	16.00
Hvy. breakable cast	15.00 to 15.50
No. 1 cast	16.00 to 16.50
Stove plate (steel wks.)	13.00
Railroad malleable	15.50 to 16.00
Machine shop turn.	8.00 to 8.50
No. 1 blast furnace	6.50 to 7.00
Cast borings	6.50 to 7.00
Heavy axle turnings	10.00 to 10.50
No. 1 low phos. hvy.	17.00 to 17.50
Couplers & knuckles	17.50 to 18.00
Rolled steel wheels	17.50 to 18.00
Steel axles	20.00 to 20.50
Shafting	20.50 to 21.00
Spec. iron & steel pipe	12.00 to 12.50
No. 1 forge fire	12.00 to 12.50
Cast boring (chem.)	9.50 to 10.00

CHICAGO

Delivered to Chicago district consumers:	
Per Gross Ton	
Hvy. mltng. steel	\$13.50 to \$13.75
Auto. hvy. mltng. steel	
alloy free	12.25 to 12.75
No. 2 auto steel	10.75 to 11.25
Shoveling steel	13.50 to 14.00
Factory bundles	12.50 to 13.00
Dealers' bundles	11.50 to 12.00
Drop forge flashings	9.75 to 10.25
No. 1 busheling	12.25 to 12.75
No. 2 busheling, old	5.75 to 6.25
Rolled carwheels	14.50 to 15.00
Railroad tires, cut	15.00 to 15.50
Railroad leaf springs	14.50 to 15.00
Steel coup. & knuckles	14.50 to 15.00
Axle turnings	12.50 to 13.00
Coil springs	16.50 to 17.00
Axle turn. (elec.)	13.50 to 14.00
Low phos. punchings	15.50 to 16.00
Low phos. plates 12 in. and under	15.00 to 15.50
Cast iron borings	6.50 to 7.00
Short shov. turn.	6.50 to 7.00
Machine shop turn.	6.50 to 7.00
Rerolling rails	18.00 to 18.50
Steel rails under 3 ft.	16.00 to 16.50
Steel rails under 2 ft.	16.50 to 17.00
Angle bars, steel	15.25 to 15.75
Cast iron carwheels	12.50 to 13.00
Railroad malleable	15.00 to 15.50
Agric. malleable	12.00 to 12.50

Per Net Ton	
Iron car axles	\$18.00 to \$18.50
Steel car axles	17.50 to 18.00
Locomotive tires	13.00 to 13.50
Pipes and flues	8.50 to 9.00
No. 1 machinery cast	12.00 to 12.50
Clean auto. cast	12.50 to 13.00
No. 1 railroad cast	11.00 to 11.50
No. 1 agric. cast	10.00 to 10.50
Stove plate	7.75 to 8.25
Grate bars	7.75 to 8.25
Brake shoes	9.50 to 10.00

YOUNGSTOWN

Per gross ton delivered to consumer:	
No. 1 hvy. mltng. steel	\$15.25 to \$15.75
No. 2 hvy. mltng. steel	14.25 to 14.75
Low phos. plate	16.50 to 17.00
No. 1 busheling	14.25 to 14.75
Hydraulic bundles	14.75 to 15.25
Machine shop turn	9.00 to 9.50

CLEVELAND

Per gross ton delivered to consumer:	
No. 1 hvy. mltng. steel	\$14.50 to \$15.00
No. 2 hvy. mltng. steel	13.50 to 14.00
Comp. sheet steel	14.25 to 14.75
Light bund. stampings	10.50 to 11.00
Drop forge flashings	11.50 to 12.00
Machine shop turn.	7.50 to 8.00
Short shov. turn.	8.00 to 8.50
No. 1 busheling	13.50 to 14.00
Steel axle turnings	10.50 to 11.00
Low phos. billet and bloom crops	17.50 to 18.00
Cast iron borings	8.00 to 8.50
Mixed bor. & turn.	8.00 to 8.50
No. 2 busheling	8.25 to 8.75
No. 1 cupola cast	15.50 to 16.00
Railroad grate bars	11.00 to 11.50
Stove plate	9.00 to 9.50
Rails under 3 ft.	17.75 to 18.25
Rails for rolling	18.25 to 18.75
Railroad malleable	15.50 to 16.00
Cast iron carwheels	13.50 to 14.00

BUFFALO

Per gross ton delivered to consumer:	
No. 1 hvy. mltng. steel	\$13.50 to \$14.00
Selected hvy. mltng.	14.00 to 14.50
No. 2 hvy. mltng. steel	12.00 to 12.50
Scrap rails	13.50 to 14.00
New hvy. bndled sheets	12.00 to 12.50
Old hydraul. bundles	10.00 to 10.50
Drop forge flashings	12.00 to 12.50
No. 1 busheling	12.00 to 12.50
Machine shop turn.	6.00 to 6.50
Knuckles & couplers	15.00 to 15.50
Coil & leaf springs	15.00 to 15.50
Rolled steel wheels	15.00 to 15.50
Shov. turnings	7.00 to 7.50
Mixed bor. & turn.	7.00 to 7.50
Cast iron borings	7.00 to 7.50
No. 1 machinery cast	15.00 to 16.00
No. 1 cupola cast	14.50 to 15.00
Stove plate	13.00 to 13.50
Steel rails under 3 ft.	18.00 to 18.50
Cast iron carwheels	13.50 to 14.00
Railroad malleable	15.00 to 15.50

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:	
Selected hvy. mltng.	\$11.75 to \$12.25
No. 1 hvy. melting	11.50 to 12.00
No. 2 hvy. melting	10.50 to 11.00
No. 1 locomotive tires	12.25 to 12.75
Misc. stand. sec. rails	12.50 to 13.00
Railroad springs	14.00 to 14.50
Bundled sheets	7.00 to 7.50
No. 1 busheling	7.50 to 8.00
Cast. bor. & turn.	2.50 to 3.00
Machine shop turn.	4.50 to 5.00
Heavy turnings	9.00 to 9.50
Rails for rolling	16.00 to 16.50
Steel car axles	17.00 to 17.50
No. 1 RR. wrought	9.75 to 10.25
No. 2 RR. wrought	11.50 to 12.00
Steel rails under 3 ft.	16.00 to 16.50
Steel angle bars	13.00 to 13.50
Cast iron carwheels	14.00 to 14.50
No. 1 machinery cast	14.50 to 15.00
Railroad malleable	12.00 to 12.50
No. 1 railroad cast	12.00 to 12.50
Stove plate	7.50 to 8.00
Grate bars	8.50 to 9.00
Brake shoes	9.50 to 10.00

CINCINNATI

Dealers' buying prices per gross ton at yards:	
No. 1 hvy. mltng. steel	\$11.25 to \$11.75
No. 2 hvy. mltng. steel	9.00 to 9.50
Scrap rails for mltng.	14.75 to 15.25
Loose sheet clippings	6.75 to 7.25
Hydraul. bndled sheets	10.75 to 11.25
Cast iron borings	3.25 to 3.75
Machine shop turn.	4.50 to 5.00
No. 1 busheling	7.25 to 7.75
No. 2 busheling	2.25 to 2.75
Rails for rolling	16.75 to 17.25
No. 1 locomotive tires	13.25 to 13.75
Short rails	17.50 to 18.00
Cast iron carwheels	12.50 to 13.00
No. 1 machinery cast	12.00 to 12.50
No. 1 railroad cast	12.00 to 12.50
Burnt cast	6.25 to 6.75
Stove plate	6.25 to 6.75
Agric. malleable	10.75 to 11.25
Railroad malleable	13.25 to 13.75
Mixed hvy. cast	10.50 to 11.00

BIRMINGHAM

Per gross ton delivered to consumer:	
Hvy. melting steel	\$13.00
Scrap steel rails	\$13.50 to 14.00
Short shov. turnings	7.50
Stove plate	9.50
Steel axles	18.50
Iron axles	18.50
No. 1 RR. wrought	10.00
Rails for rolling	16.50
No. 1 cast	15.00
Tramcar wheels	14.50 to 15.00

DETROIT

Dealers' buying prices per gross ton:	
No. 1 hvy. mltng. in-	\$10.00 to \$10.50
trial steel	
No. 2 hvy. mltng. steel	9.00 to 9.50
Borings and turnings	5.00 to 5.50
Long turnings	4.75 to 5.25
Short shov. turnings	5.75 to 6.25
No. 1 machinery cast	12.50 to 13.00
Automotive cast	13.00 to 13.50
Hvy. breakable cast	9.00 to 9.50
Stove plate	7.75 to 8.25
Hydraul. comp. sheets	11.25 to 11.75
New factory bushel	9.50 to 10.00
Sheet clippings	7.25 to 8.25
Flashings	9.50 to 10.00
Low phos. plate scrap	11.00 to 11.50

NEW YORK

Dealers' buying prices per gross ton on cars:	
No. 1 hvy. mltng. steel	\$11.00 to \$11.50
No. 2 hvy. mltng. steel	8.50 to 9.00
Hvy. breakable cast	10.50 to 11.00
No. 1 machinery cast	11.50 to 12.00
No. 2 cast	9.50 to 10.00
Stove plate	9.50 to 10.00
Shafting	15.00 to 15.50
Spec. iron & steel pipe	9.00 to 9.50
Rails for rolling	16.00 to 16.50
Clean steel turnings	4.00 to 4.50
Cast borings*	3.50 to 4.00
No. 1 blast furnace	3.50 to 4.00
Cast borings (chem.)	9.50 to 10.00
Unprepared yard scrap	6.00 to 6.50
Light iron	3.00 to 3.50
Per gross ton, delivered local foundries:	
No. 1 machin. cast†	\$13.50 to \$14.00
No. 2 cast†	10.50 to 11.00

* \$1.50 less for truck loads.

† Northern N. J. prices are \$2 to \$2.50 higher.

BOSTON

Dealers' buying prices per gross ton:	
Breakable cast	\$9.40
Machine shop turn.	3.38
Mixed bor. & turn.	2.25
Bun. skeleton long	7.65
Sha	

PRICES ON FINISHED AND SEMI-FINISHED IRON AND STEEL

Steel prices on these pages are base prices only and f.o.b. mill unless otherwise indicated. On some products either quantity deductions or quantity extras apply. In many cases gage, width, cutting, physical, chemical extras, etc., apply to the base price. Actual realized prices to the mill, therefore, are affected by extras, deductions, and in most cases the amount of freight which must be absorbed in order to meet competition.

SEMI-FINISHED STEEL

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (Rerolling only). Prices delivered Detroit are \$2 higher. F.o.b. Duluth, billets only, \$2 higher.

Per Gross Ton

Rerolling \$34.00
Forging quality 40.00

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point, Md.

Per Gross Ton

Open hearth or bessemer \$34.00
Skelp

Per Lb.

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

Per Lb.

Grooved, universal and sheared 1.90c.

Wire Rods

(No. 5 to 9/32 in.)

Per Gross Ton

Pittsburgh, Chicago or Cleveland \$43.00
Worcester, Mass. 45.00
Birmingham 43.00
San Francisco 52.00
Rods over 9/32 in. or 47/64 in., inclusive, \$5 a ton over base.

SOFT STEEL BARS

Base per Lb.

Pittsburgh, Chicago, Gary, Cleveland, Buffalo and Birmingham 2.15c.
Detroit, delivered 2.25c.
Duluth 2.25c.
Philadelphia, delivered 2.47c.
New York 2.49c.
On cars dock Gulf ports 2.50c.
On cars dock Pacific ports 2.75c.

RAIL STEEL BARS

(For merchant trade)

Pittsburgh, Chicago, Gary, Cleveland, Buffalo, Birmingham 2.00c.
On cars dock Tex. Gulf ports 2.45c.
On cars dock Pacific ports 2.70c.

BILLET STEEL REINFORCING BARS

(Straight lengths as quoted by distributors)

Pittsburgh, Chicago, Gary, Birmingham, Buffalo, Cleveland, Youngstown or Sparrows Pt. 1.80c. to 2.05c.
Detroit, delivered 1.90c. to 2.15c.
On cars dock Tex. Gulf ports 2.15c. to 2.40c.
On cars dock Pacific ports 2.50c.

RAIL STEEL REINFORCING BARS

(Straight lengths as quoted by distributors)

Pittsburgh, Chicago, Gary, Buffalo, Cleveland, Youngstown or Birmingham 1.70c. to 1.90c.
Detroit, delivered 1.80c. to 2.00c.
On cars dock Tex. Gulf ports 2.05c. to 2.25c.
On cars dock Pacific ports 2.35c.

IRON BARS

Chicago and Terra Haute 2.15c.
Pittsburgh (refined) 3.60c.

COLD FINISHED BARS AND SHAFTING*

Pittsburgh, Buffalo, Cleveland, Chicago, and Gary 2.65c.
Detroit 2.70c.

* In quantities of 10,000 to 10,000 lb.

PLATES

Base per Lb.

Pittsburgh, Chicago, Gary, Birmingham, Sparrows Point, Cleveland, Youngstown, Coatesville, Claymont, Del. 2.10c.*
Philadelphia, del'd 2.05c. to 2.15c.
New York, del'd 2.15c. to 2.29c.
On cars dock Gulf ports 2.45c.
On cars dock Pacific ports 2.60c.
Wrought iron plates, P'tg. 3.80c.

* Subject to concessions, particularly in the East, of \$2 a ton.

FLOOR PLATES

Pittsburgh or Chicago 3.35c.
New York, del'd 3.71c.
On cars dock Gulf ports 3.70c.
On cars dock Pacific ports 3.95c.

STRUCTURAL SHAPES

Base per Lb.

Pittsburgh, Chicago, Gary, Buffalo, Bethlehem or Birmingham 2.10c.
Philadelphia, del'd 2.15c.
New York, del'd 2.27c.
On cars dock Gulf ports 2.45c.
On cars dock Pacific ports 2.70c.

STEEL SHEET PILING

Base per Lb.

Pittsburgh, Chicago or Buffalo 2.40c.
On cars dock Gulf ports 2.85c.
On cars dock Pacific ports 2.90c.

RAILS AND TRACK SUPPLIES

F.o.b. Mill

Standard rails, heavier than 60 lb., per gross ton \$40.00
Angle bars, per 100 lb. 2.70

F.o.b. Basing Points

Light rails (from billets) per gross ton \$40.00
Light rails (from rail steel) per gross ton 39.00

Base per Lb.

Cut spikes 3.00c.
Screw spikes 4.55c.

Tie plates, steel 2.15c.
Tie plates, Pacific Coast ports. 2.25c.

Track bolts, to steam railroads 4.15c.

Track bolts to jobbers, all sizes (per 100 counts) 65-5

Basing points on light rails are Pittsburgh, Chicago and Birmingham; on spikes and tie plates, Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; on tie plates alone, Steelton, Pa., Buffalo; on spikes alone, Youngstown, Lebanon, Pa., Richmond, Va.

SHEETS

Hot Rolled

Base per Lb.

Pittsburgh, Gary, Birmingham, Buffalo, Sparrows Point, Cleveland, Youngstown, Middletown or Chicago 2.00c.
Detroit, delivered 2.10c.
Philadelphia, delivered 2.17c.
Granite City 2.10c.
On cars dock Pacific ports 2.50c.
Wrought iron, Pittsburgh 4.10c.

Cold Rolled*

Pittsburgh, Gary, Buffalo, Youngstown, Cleveland, Middletown or Chicago 3.05c.
Detroit, delivered 3.15c.
Granite City 3.15c.
Philadelphia, delivered 3.37c.
On cars dock Pacific ports 3.65c.

* Mill run sheets are 10c. per 100 lb. less than base; and prime only, 25c. above base.

From May 10 up to and including May 15, reductions from the base price of hot and cold rolled sheets running from \$4 to \$8 a ton were prevalent.

Concessions withdrawn, on May 15.

Subsequent to May 15, many orders originally placed at \$4 to \$6 below the base price were adjusted to the full \$8 concession.

Galvanized Sheets, 24 Gage

Pittsburgh, Chicago, Gary, Sparrows Point, Buffalo, Middletown, Youngstown or Birmingham 3.50c.
Philadelphia, del'd 3.67c.
Granite City 3.60c.
On cars dock Pacific ports 4.00c.
Wrought iron, Pittsburgh 6.10c.

Electrical Sheets (F.o.b. Pittsburgh)

Base per Lb.

Field grade 3.20c.
Armature 3.55c.
Electrical 4.05c.
Motor 4.95c.
Dynamo 5.65c.
Transformer 72 6.15c.
Transformer 65 7.15c.
Transformer 58 7.55c.
Transformer 52 8.45c.

Silicon Strip in coils—Sheet price plus silicon sheet extra width extra plus 25c per 100 lb. for coils. Pacific ports add 70c. a 100 lb.

Long Ternes

No. 24 unassorted 8-lb. coating f.o.b. Pittsburgh or Gary 3.80c.
F.o.b. cars dock Pacific ports. 4.50c.

Vitreous Enameling Stock, 20 Gage*

Pittsburgh, Chicago, Gary, Youngstown, Middletown or Cleveland 3.35c.
Detroit, del'd 3.45c.
Granite City 3.45c.
On cars dock Pacific ports 3.95c.

TIN MILL PRODUCTS

*Tin Plate

Per Base Box

Standard cokes, Pittsburgh, Chicago and Gary \$5.00
Standard cokes, Granite City 5.10

* Prices effective Nov. 10 on shipments through first quarter of 1939.

Special Coated Manufacturing Ternes

Per Base Box

Granite City \$4.40
Pittsburgh or Gary 4.30

Roofing Terne Plate (F.o.b. Pittsburgh)

(Per Package, 112 sheets, 20 x 28 in.)
8-lb. coating I.C. \$12.00
15-lb. coating I.C. 14.00
20-lb. coating I.C. 15.00
25-lb. coating I.C. 16.00
30-lb. coating I.C. 17.25
40-lb. coating I.C. 19.50

Black Plate, 29 gage and lighter Pittsburgh, Chicago and Gary 3.05c.
Granite City 3.15c.
On cars dock Pacific ports, boxed 4.00c.

HOT ROLLED STRIP (Widths up to 12 in.)

Base per Lb.

Pittsburgh, Chicago, Gary, Cleveland, Middletown, Youngstown or Birmingham 2.00c.
Detroit, delivered 2.10c.

Cooperage Stock

Pittsburgh & Chicago 2.10c.

From May 10 up to and including May 15, reductions in the base price of hot rolled strip running from \$4 to \$8 a ton were prevalent. Concessions withdrawn on May 15.

Subsequent to May 15, many orders originally placed at \$4 to \$6 below the base price were adjusted to the full \$8 concession.

COLD ROLLED STRIP*

Base per Lb.

Pittsburgh, Youngstown or Cleveland 2.80c.
Chicago 2.90c.
Detroit, delivered 2.90c.
Worcester 3.00c.

* Carbon 0.25 and less.

Commodity Cold Rolled Strip

Pittsburgh, Youngstown, or Cleveland 2.95c.
Detroit, delivered 3.05c.
Worcester 3.25c.

From May 10 up to and including May 15, reductions from the base price of cold rolled strip amounting to \$4 a ton were prevalent. Concessions withdrawn on May 15.

COLD ROLLED SPRING STEEL

Pittsburgh and

Cleveland Worcester

Carbon	0.26-0.50%	2.80c.	3.00c.
Carbon	0.51-0.75	4.30c.	4.50c.
Carbon	0.76-1.00	6.15c.	6.35c.
Carbon	1.01-1.25	8.35c.	8.55c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh, Chicago, Cleveland and Birmingham)

To Manufacturing Trade

Per Lb.

Bright wire	2.60c.
Galvanized wire, base	2.65c.
Spring wire	3.20c.

* On galvanizing wire to manufacturing trade, size and galvanizing extras are charged, the price Nos. 6 to 9 gage, inclusive, thus being 3.15c.

To the Trade

Base per Keg

Standard wire nails	\$2.40
Coated nails	2.40
Cut nails, carloads	3.60

Base per 100 Lb.

Annealed fence wire	\$2.90
Galvanized fence wire	3.30
Polished staples	3.10
Galvanized staples	3.35
Twisted barbless wire	3.25
Woven wire fence, base column	67
Single loop bale ties, base col.	56
Stand. 2 pt., 12.5 gage barbed cattle wire, per 80 rod spool	\$2.58
Stand. 2 pt., 12.5 gage barbed hog wire, per 80 rod spool	\$2.76

Note: Birmingham base same on above items, except spring wire.

Add \$4 a ton for Mobile, Ala.; \$5 for New Orleans; \$6 for Lake Charles to above bases, except on galvanized and annealed merchant fence wire, which are \$1 a ton additional in each case.

STEEL AND WROUGHT IRON PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

F.o.b. Pittsburgh only on wrought iron pipe.

Butt Weld

Steel	Weld	Wrought Iron
In. Black Galv.	In. Black Galv.	
1/8 ... 56	36	1/4 & % . +9 +30
1/4 to 3/8 59	43 1/2	1/2 ... 24 6 1/2
5/8 ... 63 1/2	54	3/4 ... 30 13
3/4 ... 66 1/2	58	1 & 1/4 34 19
1 to 3 ... 68 1/2	60 1/2	1 1/4 ... 38 21 1/2
	8	3 1/2 ... 37 1/2 21

Lap Weld

2 ... 61	52 1/2	2 ... 30 1/2 15
2 1/2 & 3 ... 64	55 1/2	2 1/2 to 3 1/2 31 1/2 17 1/2
3 1/2 to 6 ... 66	57 1/2	4 ... 33 1/2 21
7 & 8.65	55 1/2	4 1/2 to 3 32 1/2 20
9 & 10.64 1/2	55	9 to 12.28 1/2 15
11 & 12.63 1/2	54	

Butt weld, extra strong, plain ends

1/8 ... 54 1/2	41 1/2	1/4 & % . +10 +43
1/4 to 3/8 56 1/2	45 1/2	1/2 ... 25 9
3/4 ... 61 1/2	37 1/2	3/4 ... 31 15
5/8 ... 65 1/2	57 1/2	1 to 2 ... 38 22 1/2
1 to 3 ... 67 1/2	60	

Lap weld, extra strong, plain ends

2 ... 59	51 1/2	2 ... 33 1/2 18 1/2
2 1/2 & 3 ... 63	55 1/2	2 1/2 to 4 39 1/2 25 1/2
3 1/2 to 6.66 1/2	59	4 1/2 to 6.37 1/2 24
7 & 8.65 1/2	56	7 & 8.38 1/2 24 1/2
9 & 10.64 1/2	55	9 to 12.32 20 1/2
11 & 12.63 1/2	54	

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or \$4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or \$2 a ton higher, on all butt weld 8 in. and smaller.

Boiler Tubes

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes. Minimum Wall. (Net base prices per 100 ft. f.o.b. Pittsburgh in carload lots)

	Seamless	Lap
	Cold	Hot
	Drawn	Rolled
1 in. o.d. ... 18 B.W.G.	\$ 9.01	\$ 7.82
1 1/2 in. o.d. ... 13 B.W.G.	10.67	9.26
1 1/2 in. o.d. ... 13 B.W.G.	11.70	10.23
1 1/2 in. o.d. ... 13 B.W.G.	13.42	11.64
1 1/2 in. o.d. ... 13 B.W.G.	15.08	13.04
2 1/2 in. o.d. ... 13 B.W.G.	16.76	14.54
2 1/2 in. o.d. ... 12 B.W.G.	18.45	16.01
2 1/2 in. o.d. ... 12 B.W.G.	20.21	17.54
2 1/2 in. o.d. ... 12 B.W.G.	21.42	18.59
3 in. o.d. ... 12 B.W.G.	22.48	18.50
3 1/2 in. o.d. ... 12 B.W.G.	23.37	24.62
4 in. o.d. ... 10 B.W.G.	35.20	30.54
4 1/2 in. o.d. ... 10 B.W.G.	43.04	37.35
5 in. o.d. ... 9 B.W.G.	54.01	46.87
5 1/2 in. o.d. ... 8 B.W.G.	82.93	71.96

Extras for less carload quantities:

10,000 lb. or ft. over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 8,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

CAST IRON WATER PIPE

Per Net Ton

*6-in. and larger, del'd Chicago	\$51.00
6-in. and larger, del'd New York	49.00
*6-in. and larger, Birmingham	43.00
6-in. and larger, f.o.b. dock, San Francisco or Los Angeles	52.00
F.o.b. dock, Seattle	52.00
4-in. f.o.b. dock, San Francisco or Los Angeles	55.00
F.o.b. dock, Seattle	52.00

Class "A" and gas pipe, \$3 extra 6-in. pipe is \$3 a ton above 6-in.

Prices for lots of less than 200 tons. For 200 tons and over, 6-in. and larger is \$42, Birmingham, and \$3 delivered Chicago and 4-in. pipe, \$45, Birmingham, and \$54 delivered Chicago.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Per Cent Off List

Machine and carriage bolts:

1/4 in. and 6 in. and smaller	68%
Larger and longer up to 1 in.	66
1 1/4 in. and larger	64

Lag bolts	66
Plow bolts, Nos. 1, 2, 3, and 7	68%

Hot pressed nuts, and c.p.c. and t-nuts, square or hex. blank or tapped:	
1/4 in. and smaller	67
9/16 in. to 1 in. inclusive	64
1 1/4 in. and larger	62

On the above items with the exception of plow bolts, there is an additional allowance of 10 per cent for full container quantities.

On all of the above items, there is an additional 5 per cent allowance for carload shipments.

Semi-fin. hexagon nuts U.S.S. S.A.E.	
1/4 in. and smaller	67 70
9/16 in. to 1 in.	64 65
1 1/4 in. and larger	62 62

In full container lots, 10 per cent additional discount.

Stove bolts in packages, nuts attached

7/16 in. to 1 in.	72 1/2
Stove bolts in packages, with nuts separate	72 1/2 and 12 1/2

Stove bolts in bulk.

On stove bolts freight is allowed to destination on 200 lb. and over.

Large Rivets

(1/2 in. and larger)

Base Per 100 Lb.

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

..... \$3.40

Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham

..... 65 and 10

Cap and Set Screws

(Freight allowed to destination)

Per Cent Off List

Milled hexagon head, cap screws, 1 in. dia. and smaller

50 and 10	
Milled headless set screws, cut thread 1/4 in. and smaller	70

Upset hex. head cap screws U.S.S. or S.A.E. thread 1 in. and smaller

67 1/2	
Upset set screws, cup and oval points	75

Milled studs

Alloy Steel

Alloy Steel Blooms, Billets and Slabs

F.o.b. Pittsburgh, Chicago, Canton, Massillon, Buffalo, Bethlehem.

Base price, \$56.00 a gross ton.

Alloy Steel Bars

F.o.b. Pittsburgh, Chicago, Buffalo, Bethlehem, Massillon or Canton.

Open-hearth grade, base

..... 2.70c.

Delivered, Detroit

..... 2.80c.

S.A.E. Alloy

..... Differential

Series Numbers

..... per 100 Lb.

200 (1 1/2% Nickel)

..... \$0.35

2100 1 1/4% Nickel)

..... \$0.76

2300 (3 1/2% Nickel)

..... 2.25

2500 (5% Nickel)

..... 0.70

3100 Nickel-chromium

..... 1.85

3200 Nickel-chromium

..... 3.30

3400 Nickel-chromium

..... 3.20

4100 Chromium-molybdenum (0.15 to 0.25 Molybdenum)

..... 0.55

4100 Chromium-molybdenum (0.25 to 0.40 Molybdenum)

..... 0.75

4340 Chr.-Ni.-Mo.

..... 1.65

4345 Chr.-Ni.-Mo.

..... 1.85

4600 Nickel molybdenum (0.20 to 0.30 Mo. 1.50 to 2.00 Ni.)

..... 1.10

5100 Chrome steel (0.60-0.90 Cr.)

..... 0.35

5100 Chrome steel (0.80-1.10 Cr.)

RAW MATERIALS PRICES

PIG IRON

No. 2 Foundry

F.o.b. Everett, Mass.	\$22.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa., and Sparrows Point, Md.	22.00
Delivered Brooklyn	24.50
Delivered Newark or Jersey City	23.53
Delivered Philadelphia	22.84
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	21.00
F.o.b. Buffalo	21.00
F.o.b. Detroit	21.00
Southern, delivered Cincinnati	21.06
Northern, delivered, Cincinnati	21.44
F.o.b. Duluth	21.50
F.o.b. Provo, Utah	19.00
Delivered, San Francisco, Los Angeles or Seattle	24.50
F.o.b. Birmingham*	17.38

* Delivered prices on southern iron for shipment to northern points are 38c. a ton below delivered prices from nearest northern basing point on iron with phosphorus content of 0.70 per cent and over.

Malleable

Base prices on malleable iron are 50c. a ton above No. 2 foundry quotations at Everett, Eastern Pennsylvania furnaces, Erie and Buffalo. Elsewhere they are the same, except at Birmingham and Provo, which are not malleable iron basing points.

Basic

F.o.b. Everett, Mass.	\$21.50
F.o.b. Bethlehem, Birdsboro, Swedeland and Steelton, Pa., and Sparrows Point, Md.	21.50
F.o.b. Buffalo	20.00
F.o.b. Neville Island, Erie, Pa., Toledo, Chicago, Granite City, Cleveland and Youngstown	20.50
Delivered Philadelphia	22.34
Delivered Canton, Ohio	21.89
Delivered Mansfield, Ohio	22.44
F.o.b. Birmingham	16.00

Bessemer

F.o.b. Buffalo	\$22.00
F.o.b. Everett, Mass.	23.00
F.o.b. Bethlehem, Birdsboro and Swedeland, Pa.	23.00
Delivered Newark or Jersey City	24.53
Erie, Pa., and Duluth	22.00
F.o.b. Neville Island, Toledo, Chicago and Youngstown	21.50
F.o.b. Birmingham	22.00
Delivered Cincinnati	22.11
Delivered Canton, Ohio	22.89
Delivered Mansfield, Ohio	23.44

Low Phosphorus

Basing points: Birdsboro, Pa., Steelton, Pa., and Standish, N. Y. \$26.50

Gray Forge

Valley or Pittsburgh furnace \$20.50

Charcoal

Lake Superior furnace \$25.00
Delivered Chicago 28.34

Canadian Pig Iron

Per Gross Ton

Montreal	
Foundry iron	\$24.50 base
Malleable	25.00 base
Basic	24.50 base

Toronto

Foundry iron	\$22.50 base
Malleable	23.00 base
Basic	22.50 base

On all grades 2.25 per cent silicon and under is base. For each 25 points of silicon over 2.25 per cent an extra of 25c. is charged.

FERROALLOYS

Ferromanganese

F.o.b. New York, Philadelphia, Baltimore, Mobile or New Orleans.

Per Gross Ton

Domestic, 80% (carload) \$30.00

Spiegeleisen

Per Gross Ton Furnace

Domestic, 19 to 21% \$28.00

Domestic, 26 to 28% 33.00

Electric Ferrosilicon

Per Gross Ton Delivered;

Lump Size

50% (carload lots, bulk) \$69.50*

50% (ton lots in 50 gal. bbl.) 80.50*

75% (carload lots, bulk) 126.00*

75% (ton lots in 50 gal. bbl.) 139.00*

Bessemer Ferrosilicon

F.o.b. Furnace, Jackson, Ohio

Per Gross Ton

10.00 to 10.50% \$30.50

For each additional 0.50% silicon up to 12%, 50c. per ton is added. Above 12% add 75c. per ton.

For each unit of manganese over 2%, \$1 a ton additional.

Base prices at Buffalo are \$1.25 a ton higher than at Jackson.

Silvery Iron

Per Gross Ton

F.o.b. Jackson, Ohio, 5.00 to 5.50% \$24.50

For each additional 0.5% silicon up to 12%, 50c. a ton is added. Above 12% add 75c. a ton.

The long all-rail delivered price from Jackson or Buffalo is quoted with freight allowed. Base prices at Buffalo are \$1.25 a ton higher than at Jackson.

Manganese, each unit over 2%, \$1 a ton additional. Phosphorus 0.75% or over, \$1 a ton additional.

Ferrochrome

Per Lb. Contained Cr., Delivered Carlots, Lump Size, on Contract

4 to 6% carbon 10.50c.*

2% carbon 16.50c.*

1% carbon 17.50c.*

0.10% carbon 19.50c.*

0.06% carbon 20.00c.*

Silico-Manganese

Per Gross Ton, Delivered, Lump Size, Bulk, on Contract

3% carbon \$83.00

2.50% carbon 88.00

2% carbon 93.00

1% carbon 103.00

Other Ferroalloys

Ferrotungsten, per lb. contained W del., carloads \$1.75

Ferrotungsten, 100 lbs. and less 2.00

Ferrovanadium, contract, per lb. contained V, delivered \$2.70 to \$2.90†

Ferrocolumbium, per lb. contained columbium, f.o.b. Niagara Falls, N. Y., ton lots \$2.25†

Ferrocobaltitanium, 15 to 18% Ti, 7 to 8% C, f.o.b. furnace carload and contract per net ton \$142.50

Ferrocobaltitanium, 17 to 20% Ti, 3 to 5% C, f.o.b. furnace, carload and contract, per net ton \$157.50

Ferrophosphorus, electric, or blast furnace material, in carloads, f.o.b. Anniston, Ala., for 18%, with \$3 unitage, freight equalized with Rockdale, Tenn., per gross ton \$58.50

Ferrophosphorus, electrolytic, 23-26% in car lots, f.o.b. Monsanto (Siglo), Tenn., 24%, per gross ton, \$3 unitage, freight equalized with Nashville \$75.00

Ferromolybdenum, per lb. Mo. f.o.b. furnace 95c.

Calcium molybdate, per lb. Mo. f.o.b. furnace 80c.

Molybdenum oxide briquettes 48-52% Mo; per lb. contained Mo, f.o.b. Langloch, Pa. 80c.

* Spot prices are \$5 per ton higher.

† Spot prices are 10c. per lb. of contained element higher.

ORES

Lake Superior Ores

Delivered Lower Lake Ports

Per Gross Ton

Old range, Bessemer, 51.50% \$5.25

Old range, non-Bessemer, 51.50% 5.10

Messabi, Bessemer, 51.50% 5.10

Messabi, non-Bessemer, 51.50% 4.95

High phosphorus, 51.50% 4.85

Foreign Ore

C.i.f. Philadelphia or Baltimore

Per Unit

Iron, low phos., copper free, 55 to 58% dry, Alogeira 12c.

Iron, low phos., Swedish, average, 68 1/2% iron 12c.

Iron, basic or foundry, Swedish, aver. 65% iron 11c.

Iron, basic or foundry, Russian, aver. 65% iron Nominal

Man., Caucasian, washed 52% 29c.

Man., African, Indian, 44-48% 25c.

Man., African, Indian, 49-51% 28c.

Man., Brazilian, 46 to 48% 27c.

Per Short Ton Unit

Tungsten, Chinese, Wolframite, duty paid, delivered \$18.00

Tungsten, domestic, scheelite delivered \$15.00 to \$16.00

Chrome or (lump) c.i.f. Atlantic Seaboard, per gross

ton: South African (low grade) \$15.00

Rhodesian, 45% 19.00

Rhodesian, 48% 22.00

Turkish, 48-49% 22.50

Turkish, 45-56% 19.50

Turkish, 40-41% 17.00

Chrome concentrates (Turkish) c.i.f. Atlantic Seaboard, per gross ton:

50% \$24.00

48-49% 23.50

FLUORSPAR

Per Net Ton

Domestic washed gravel, 85-5, f.o.b. Kentucky and Illinois mines, all rail \$17.00

Domestic, f.o.b. Ohio River landing barges \$18.00 to 19.00

No. 2 lump, 85-5, f.o.b. Kentucky and Ill. mines 18.00

Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic ports, duty paid 21.50

Domestic No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2 1/2% silicon, f.o.b. Illinois and Kentucky mines 31.50

COKE

Per Net Ton

Furnace, f.o.b. Connells-ville, Prompt \$3.75c.

Furnace, f.o.b. Connells-ville, Prompt \$4.75 to 5.50

Foundry, by - product Chicago ovens 10.25

Foundry, by - product, del'd New England 12.50

Foundry, by - product, del'd Newark or Jersey City 10.88 to 11.40

Foundry, by - product, Philadelphia 10.95

Foundry, by - product, delivered Cleveland 10.30

Foundry, by - product, delivered Cincinnati 9.75

Foundry, Birmingham 7.50

Foundry, by - product, del'd St. Louis industrial district 10.75 to 11.00

Foundry, from Birmingham, f.o.b. cars dock Pacific ports 14.75

IRON AND STEEL WAREHOUSE PRICES

PITTSBURGH*

	Base per Lb.
Plates	3.40c.
Shapes	3.40c.
Soft steel bars and small shapes	3.35c.
Reinforcing steel bars	2.70c.
Cold finished bars and screw stock	3.65c.
Hot rolled strip	3.60c.
Hot rolled sheets	3.35c.
Galv. sheets (24 ga.) 500 lb. to 1499 lb.	4.50c.
Wire, black, soft annealed	3.15c.
Wire, galv., soft	3.55c.
Track spikes (1 to 24 kegs)	3.60c.
Wire nails (in 100-lb. kegs)	2.65c.

On plates, structural, bars, strip and hot rolled sheets, base applied to orders of 400 to 1999 lb. On reinforcing bars base applies to orders of less than one ton and includes switching and carting charge.

All above prices for delivery within the Pittsburgh switching district.

NEW YORK

	Base per Lb.
Plates, 1/4 in. and heavier	3.75c.
Structural shapes	3.75c.
Soft steel bars, round	3.84c.
Iron bars, Swed. char-coal	7.50 to 8.25c.
Cold-fin. shafting and screw stock:	
Rounds, squares, hexagons	4.09c.
Flats up to 12 in. wide	4.09c.
Cold-rolled strip soft and quarter hard	3.51c.
Hot-rolled strip, soft O.H.	3.96c.
*Hot-rolled sheets (8-30 ga.)	3.40c.
Galv. sheets (24 ga.)	4.50c.
Long ternes (24 ga.)	5.60c.
Cold-rolled sheets (20 ga.)	
Standard quality	4.60c.
Deep drawing	4.85c.
Stretcher leveled	5.10c.
SAE, 2300, hot-rolled	7.35c.
SAE, 3100, hot-rolled	5.90c.
SAE, 6100, hot-rolled annealed	8.75c.
SAE, 2300, cold-rolled	8.59c.
SAE, 3100, cold-rolled, annealed	8.19c.
Floor plate, 1/4 in. and heavier	5.56c.
Standard tool steel	12.50c.
Wire, black, annealed (No. 9)	4.35c.
Wire, galv. (No. 9)	4.70c.
Open-hearth spring steel	4.75c. to 10.25c.
Common wire nails, per keg in 25 keg lots	\$2.90

*For lots less than 2000 lb.

CHICAGO

	Base per Lb.
Plates and structural shapes	3.55c.
Soft steel bars, rounds and angles	3.50c.
Soft steel squares, hexagons, channels and Tees	3.65c.
Hot rolled strip	3.60c.
Floor plates	5.15c.
Hot rolled sheets	3.35c.
Galvanized sheets	4.25c.
Cold rolled sheets	4.30c.
Cold finished carbon bars	3.75c.

Above prices are subject to deductions and extras for quantity and are f.o.b. consumer's plant within Chicago free delivery zone.

CLEVELAND

	Base per Lb.
Plates	3.40c.
Structural shapes	3.58c.
Soft steel bars	3.25c.
Reinfor. bars (under 2000 lb.)†	2.55c.
Cold-fin. bars (1000 lb. over)	3.75c.
Hot-rolled strip	3.50c.
Cold rolled sheets	4.55c.
Cold-finished strip	3.20c.
Galvanized sheets (No. 24)	4.62c.
Hot-rolled sheets	3.35c.
Floor plates, 3/16 in. and heavier	5.18c.
*Black ann'd wire, per 100 lb.	\$3.10
*No. 9 galv. wire, per 100 lb.	3.50
Com. wire nails, base per keg	2.60
Hot rolled alloy steel (3100)	5.85c.
Cold rolled alloy steel (3115)	6.75c.

* For 5000 lb. or less.

† 500 lb. base quantity.

Prices shown on hot rolled bars, strip, sheets, and plates are for 400 to 1999 lb. Alloy steel, 1000 lb. and over; galvanized sheets, 150 to 1499 lb.; cold rolled sheets, 399 lb. and under.

ST. LOUIS

	Base per Lb.
Plates and structural shapes	3.47c.
Bars, soft steel (rounds and flats)	3.62c.
Bars, soft steel (squares, hexagons, ovals, half ovals and half rounds)	3.77c.
Cold fin. rounds, shafting, screw stock	4.02c.
Galv. sheets (24 ga.)	4.53c.
Hot rolled sheets	3.38c.
Galv. corrugated sheets, 24 ga. and heavier*	4.58c.
Structural rivets	5.02c.

* No. 26 and lighter take special prices.

BOSTON

	Base per Lb.
Structural shapes, 3 in. and larger	3.85c.
Plates, 1/4 in. and heavier	3.85c.
Bars	3.88c.
Heavy hot rolled sheets	3.71c.
Hot rolled sheets	4.21c.
Hot rolled annealed sheets	4.61c.
Galvanized sheets	4.61c.
Cold rolled sheets	4.71c.

The following quantity differentials apply: Less than 100 lb., plus \$1.50 per 100 lb.; 100 to 399 lb., plus 50c.; 400 to 1999 lb. base; 2000 to 9999 lb., minus 20c.; 10,000 to 39,999 lb., minus 30c.; 40,000 lb. and over minus 40c.

BUFFALO

	Base per Lb.
Plates	3.62c.
Floor plates	5.25c.
Struc. shapes	3.40c.
Soft steel bars	3.35c.
Reinforcing bars (20,000 lb. or more)	2.05c.
Cold-fin. flats, squares, rounds, and hex.	3.65c.
Hot-rolled sheets, 3/16 x 14 in. to 48 in. wide incl., also sizes	3.35c.
No. 8 to 30 ga.	4.50c.
Galv. sheets (24 ga.)	3.82c.
Bands and hoops	

NEW ORLEANS

	Base per Lb.
Mild steel bars	4.20c.
Reinforcing bars	3.24c.
Structural shapes	4.10c.
Plates	4.10c.
Hot-rolled sheets, No. 10	4.35c.
Steel bands	4.75c.
Cold-finished steel bars	5.10c.
Structural rivets	4.85c.
Bolier rivets	4.85c.
Common wire nails, base per keg	3.55
Bolts and nuts, per cent off list	60

REFRACTORIES PRICES

Fire Clay Brick

Per 1000 f.o.b. Works

Super-duty brick, at St. Louis	\$60.80
Maryland, Kentucky, Missouri and Illinois	47.50
First quality, New Jersey	52.50
Second quality, Pennsylvania, Maryland, Kentucky, Missouri and Illinois	42.75
Second quality, New Jersey	49.00
No. 1 Ohio	39.90
Ground fire clay, per ton	7.10

Silica Brick

Per 1000 f.o.b. Works

Pennsylvania	\$47.50
Chicago District	55.10
Birmingham	47.50
Silica cement per net ton (Eastern)	8.55

Chrome Brick

Net per Ton

Standard f.o.b. Baltimore, Plymouth Meeting and Chester	\$47.00
Chemically bonded f.o.b. Baltimore, Plymouth Meeting and Chester, Pa.	47.00
Magnesite Brick	
Net per Ton	

Standard f.o.b. Baltimore and Chester	\$67.00
Chemically bonded, f.o.b. Baltimore	57.00
Grain Magnesite	
Net per Ton	

Imported, f.o.b. Baltimore and Chester, Pa. (in sacks)	\$45.00
Domestic, f.o.b. Baltimore and Chester in sacks	40.00
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

PHILADELPHIA

	Base per Lb.
Plates, 1/4-in. and heavier	3.40c.
Structural shapes	3.40c.
Soft steel bars, small shapes, iron bars (except bands)	3.60c.
Reinfor. steel bars, square and deformed	2.61c.
Cold-finished steel bars	4.06c.
Steel hoops	4.10c.
Steel bands, No. 12 and 3/16 in. incl.	3.60c.
Spring steel	4.75c.
Hot-rolled anneal. sheets	3.40c.
Galvanized sheets (No. 24)	4.23c.
Diam. pat. floor plates, 1/4 in.	5.00c.

These prices are for delivery in Philadelphia trucking area.

*For quantities between 400 and 1999 lb.

†For 10 bundles or over.

‡For one to five tons.

BIRMINGHAM

	Base per Lb.
Bars and bar shapes	3.50c.
Structural shapes and plates	3.55c.
Hot rolled sheets No. 10 ga.	3.35c.
Galvanized sheets No. 24 ga.	4.75c.
or more	
Strip	3.60c.
Reinforcing bars	3.50c.
Floor plates	5.88
Cold finished bars	4.43
Machine and carriage bolts	50 & 10 off list
Rivets (structural)	\$4.60 base

On plates, shapes, bars, hot-rolled strip heavy hot-rolled sheets, the base applies on 400 to 1999 lb. All prices are f.o.b. consumer plant.

PACIFIC COAST

	Base per Lb.
San Fran. and Los Angeles	
Plates, tanks and U. M.	3.45c.
Shapes, standard	3.45c.
Soft steel bars	3.50c.
Reinforcing bars, f.o.b. cars dock	
Pacific ports	2.275c. open. 2.975c.
Hot-rolled sheets (No. 10)	3.45c. 4.00c. 3.70c.
Galv. sheets (No. 24 and lighter)	5.15c. 4.75c. 5.00c.
Galv. sheets (No. 22 and heavier)	5.40c. 4.75c. 5.00c.
Cold-finished steel	
Rounds	6.55c. 6.60c. 7.10c.
Squares and hexagons	7.80c. 7.85c. 7.10c.
Flats	8.

Ceiling to Wages, Floor to Hours

(CONTINUED FROM PAGE 37)

in working hours, no improved standard of living.

Just as the original industries producing comforts and luxuries were founded upon labor released through installation of labor saving devices in the basic industries, so future growth and development of secondary industries will continue to rest upon introduction of still further labor saving devices in both primary and secondary industries. Labor may choose to sterilize its increased productivity through demanding increased leisure. To the extent it does this, it will retard the growth of new industry.

Economic Limitations

Length of work week may be reduced to a point where further reductions result in decreased output and higher production costs. Where this occurs, the increased costs, which will be accompanied with a decreased consumer demand, will also operate to effect a cut in wages. In such cases labor has to pay for the reduction in hours through a lowering of its standard of living; for a short work week may be shortened to a point where it in effect becomes a part time job and participates in all of the penalties of part time employment. Then the shortened hours fixed for labor will clearly have crashed through their economic floor.

The personnel of the new secondary industries of the future will have to be recruited from the man power displaced through the installation of labor saving devices in present industries. The capital to finance these new industries will, moreover, have to be accumulated through savings effected in the labor cost of the older industries. Only if the labor displaced by new inventions seeks fresh outlets in industry is it possible to effect general increases in wages and to advance prevailing standards of living.

To offset all labor saved through technological advance by a progressive shortening of the work week is, in effect, to boycott the installation of further labor saving devices; it is virtually a strike against the very progress which makes increases in real wages or an improvement in the standard of living possible.

Apparently wages may be increased, then, without diminishing their yield to labor, only up to the point where further increase must be added to the price of the product. But when a

wage increase raises the price of a product, it curtails both consumption and production. A wage increase which produces unemployment stifles itself. A fact frequently overlooked is that unemployment is made worse than it would otherwise be by the payment of wages higher than business conditions justify.

Where well advised, workers will seek, not a higher unit rate of pay, as such, but a wage scale which, taken in conjunction with the length of work week and working conditions, will produce a maximum work opportunity. The optimum wage is that rate of remuneration which produces the maximum yearly earnings. A wage scale which tops this mark plainly pierces the economic ceiling for wages.

. . . GREAT BRITAIN . . .

British works extremely busy . . . Pig iron arrives from Australia.

LONDON, July 18 (By Cable)—Armament, defense and merchant shipbuilding are still furnishing the better part of steel business. All works are extremely busy and are curtailing holidays. Commercial users are obliged to wait a long time for deliveries of new business.

The first parcels of Australian pig iron have arrived here and large imports of semi-finished steel from Australia are imminent.

The Continent reports quieter conditions but Scandinavia and the Baltic countries are good buyers of merchant bars. United Kingdom and Japan are specifying semi-finished steel.

Negotiations between the International Tube Cartel and Sweden collapsed. The Swedish quota demands were said to be too high.

The Yugoslavia Government is to spend 1,500,000,000 dinars for the renewal of railway material over the next few years. Germany is granting Yugoslavia credit for 200,000,000 marks. Skoda is supplying the war materials. Turkey voted to credit £2,000,000 for the purchase of new ships. Turkey is to spend £700,000 for the establishment of a train ferry at Bosphorus.

There has been a strong home demand for tin plate following the advice of the Government to householders to

accumulate food reserves. Sales have been made to the end of the first quarter. Exports are moderate.

Black and galvanized sheet mills are fully sold for many months on air raid shelters and other defense orders.

Iron and steel imports in June in the United Kingdom totaled 200,000 tons, of which 6000 tons was from the United States. Scrap imports amounted to 112,000 tons. Exports totaled 162,000 tons of which 6000 tons was pig iron; black sheets, 9000 tons; galvanized sheets, 14,000 tons; tin plate, 29,000 tons. Scrap exports amounted to 9000 tons.

CANADA . . .

Foreign orders continue to feature Dominion business.

TORONTO, July 18—While there has been a tapering off in domestic demand for iron and steel in the Canadian markets, export business showed some betterment during the past week.

Announcement is made that the South African Railways and Harbor Administration of South Africa has placed contracts with British and Canadian firms involving an outlay of approximately \$3,500,000 for 95,000 tons of steel rails. Of this order two Canadian companies, Algoma Steel Corp., Sault Ste. Marie, Ont., and Dominion Steel & Coal Corp., Sydney, N. S., will divide 29,000 tons. The rails will be transported in British vessels. Additional airplane contracts from the National Defence Department, Ottawa, for 27 training planes to cost \$250,000, went to Fleet Aircraft Co., Fort Erie, Ont.

Slowing down of activities in the automotive industry largely is responsible for slowing down in demand for steel, while on the other hand there is sustained demand for sheets and bars from electric stove and refrigerator makers. Building trades are furnishing good orders for reinforcing bars and structural steel.

Fast Passenger Ship Planned for Great Lakes

TOLEDO—Toledo Shipbuilding Co. is making plans for a new type of 350-ft. lake vessel planned to carry 1000 passengers and 40 automobiles with a cruising speed of 23 miles an hour. George G. Sharp, New York, naval architect, is preparing the plans for a group of Detroit business men.

NON-FERROUS . . .

... Copper quiet after previous week's heavy buying . . . Lead and zinc demand in heavy volume . . . Stronger stock market here and higher foreign prices are encouraging factors.

NEW YORK, July 18—Stimulated by the stronger stock market here, prices in the foreign markets made encouraging gains in the past week, in the case of lead laying the groundwork for another possible rise in the domestic quotation. Both lead and zinc buying were at excellent levels all week, but copper buyers retired after the heavy purchasing of the preceding week and the producers' market was a dull affair

all week, with sales averaging around 1000 tons a day. The month's sales of copper, through Saturday, totaled slightly over 160,000 tons. Producers' copper prices are unchanged at 11.25c. per lb., delivered Connecticut Valley, while the open market price has declined to 10.20c. per lb. without encouraging any noticeable consumer buying. Foreign copper sales were maintained at a very satisfactory level all week, though not quite up to the

NON-FERROUS PRICES

Cents per lb. for early delivery

	July 12	July 13	July 14	July 15	July 17	July 18
Copper, Electrolytic ¹	10.25	10.25	10.25	10.25	10.25	10.25
Copper, Lake	10.25	10.25	10.25	10.25	10.25	10.25
Tin, Straits, New York	48.50	48.55	48.60	...	48.50	48.60
Zinc, East St. Louis ²	4.50	4.50	4.50	4.50	4.50	4.50
Lead, St. Louis ³	4.70	4.70	4.70	4.70	4.70	4.70

¹ Delivered Conn. Valley. Deduct 1/4c. for New York delivery. ² Add 0.39c. for New York delivery. ³ Add 0.15c. for New York delivery.

* Quotation for July 7, 8, 10 and 11 should have been 10.25c., instead of 10c. as quoted in issue of July 13.

Warehouse Prices

1 Cents per lb., Delivered

	New York	Cleveland
Tin, Straits pig	49.60c.	51.50c.
Copper, Lake	11.50c.	11.375c.
Copper, electro	11.375c.	11.375c.
Copper, Castings	11.00c.	11.125c.
*Copper sheets, hot-rolled	18.37c.	18.37c.
*High brass sheets	16.65c.	16.65c.
*Seamless brass tubes	19.40c.	19.40c.
*Seamless copper tubes	18.87c.	18.87c.
*Brass rods	12.00c.	12.00c.
Zinc slabs	6.15c.	6.90c.
Zinc sheets, No. 9 casks	10.50c.	12.10c.
Lead, American pig	5.85c.	5.70c.
Lead, bar	6.45c.	8.25c.
Lead, sheets, cut	8.00c.	8.00c.
Antimony, Asiatic	15.00c.	17.00c.
Alum., virgin, 99 per cent plus	22.50c.	22.50c.
Alum., No. 1 remelt, 98 to 99 per cent	19.50c.	19.50c.
Solder, 1/2 and 1/2	29.25c.	29.50c.
Babbitt metal, commercial grade	21.25c.	21.50c.

*These prices, which are also for delivery from Chicago warehouses, are quoted with the following percentages allowed off for extras: on copper sheets, 33 1/3; on brass sheets and rods, 40, and on brass and copper tubes, 25.

Old Metals

Cents per lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators. Selling prices are those charged to consumers after the metal has been prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible..	8.00c.	9.625c.
Copper, hvy. and wire.	7.00c.	7.375c.
Copper, light and bot-		
toms	6.125c.	6.375c.
Brass, heavy	4.25c.	4.75c.
Brass, light	3.375c.	4.125c.
Hvy. machine compo-		
sition	6.125c.	7.625c.
No. 1 yel. brass turnings	4.00c.	4.50c.
No. 1 red brass or com-		
pos. turnings	6.00c.	6.50c.
Lead, heavy	3.875c.	4.75c.
Cast aluminum	6.50c.	7.75c.
Sheet aluminum	12.25c.	13.75c.
Zinc	2.125c.	3.375c.

Miscellaneous Non-Ferrous Prices

ALUMINUM, delivered; virgin, 99 per cent plus, 20c.-21c. a lb.; No. 12 remelt No. 2 standard, 19c.-19.50c. a lb. NICKEL, electrolytic, 35c.-36c. a lb. base refinery, lots of 2 tons or more. ANTIMONY, prompt, New York; Asiatic, 14c. a lb. f.o.b.; American, 12c. a lb. QUICKSILVER, \$89-\$91 per flask of 76 lb. BRASS INGOTS, commercial 85-5-5-5, 10.50c. a lb.

volume of the preceding week. This morning's foreign business was done chiefly at 10.325c. per lb., up about five points over Monday's close.

Lead

The higher stock market here and the improved prices in London acted to bring out a very heavy demand for lead in the past week, the period's well diversified buying being about 50 per cent higher than that of the previous week. About two-thirds of the sales specified August shipment, the balance calling for July delivery. At the end of the week the July books were estimated to be 95 per cent filled, with August about half covered. The higher prices prevailing in London, considered by some the result of efforts by the cartel which is reportedly aiming at £16, have revived the possibility of an increase in the domestic quotation. This morning's equivalent in London was 3.12c. per lb., on spot, or, after adding ocean charges, etc., about \$3 a ton above prices here. Up to the time of going to press, however, domestic sellers were still quoting 4.85c. per lb., New York.

Zinc

Sales in the past week rose unexpectedly to 6300 tons from 2960 tons in the preceding week, and deliveries, at 4350 tons, were also sharply higher. The increased tempo was credited to the same causes which influenced the week's better lead buying. The bulk of the week's turnover was earmarked for shipment before October, only about a 1000 tons going beyond that date. The backlog of undelivered orders now stands at 37,400 tons. Domestic quotations remain unaltered at 4.89c. per lb., New York. This morning's sales in London were done at 2.99c. per lb., on spot, a two-point rise over Monday's close and almost five points over a week ago.

Tin

A moderate amount of carload business was done in the past week, with tin plate and automobile makers doing most of the buying. Prices were steady all week, staying within a 10-point range below 48.60c. Today's prompt Straits price of 48.60c., New York, compares with 48.50c. on Tuesday a week ago. The nearby supply situation abroad is still rather tight, with a 95-point discount prevailing on three months' delivery as compared with a 10-point concession here. On first call in London this morning cash standards were £229 17s. 16d.

FABRICATED STEEL

... Lettings in fair volume at 19,150 tons ... New projects higher at 13,700 tons as against 9500 tons last week ... Plate awards only 355 tons.

NORTH ATLANTIC STATES AWARDS

4200 Tons, Washington, office building for Lafayette Corp., to Fort Pitt Bridge Works Co., Pittsburgh.
 700 Tons, Somerset, Pa., highway bridges, section 8-B-1, Pennsylvania Turnpike Commission, to Fort Pitt Bridge Works Co., Pittsburgh.
 560 Tons, Brooklyn, addition to school No. 67, to Lehigh Structural Steel Co., Allegheny, Pa.
 535 Tons, Brockport, N. Y., State Normal Practice School, to F. L. Hughes & Co., Rochester, N. Y.
 375 Tons, Schenectady County, N. Y., State highway bridge, to Lackawanna Steel Construction Corp., Buffalo.
 360 Tons, Hagerstown, Md., State bridge over Elizabeth Street, to American Bridge Co., Pittsburgh.
 270 Tons, Palmerton, Pa., roasting building for New Jersey Zinc Co., to Bethlehem Fabricators, Inc., Bethlehem, Pa.
 250 Tons, Springfield, Mass., B. & G. Merriam Co. office building, to Haarmann Steel Co., Holyoke, Mass.
 200 Tons, Brooklyn, Shore Parkway bridge, contract SS-39-6, to American Bridge Co., Pittsburgh.
 145 Tons, Port Richmond, N. Y., addition to high school, to Weatherly Steel Co., Weatherly, Pa.
 140 Tons, Rutland, Vt., grandstand, for Rutland County Agricultural Society, to Patch-Wegner Co., Rutland.
 135 Tons, Kenyons, R. I., New Haven Railroad bridge, to Bethlehem Steel Co., Bethlehem, Pa.
 100 Tons, Framingham, Mass., Newberry store, to Lehigh Structural Steel Co., Allentown, Pa.

THE SOUTH

810 Tons, Lampasas and San Saba Counties, Tex., bridge; divided equally between Virginia Bridge Co., Roanoke, Va., and North Texas Iron & Steel Co., Fort Worth, Tex.
 510 Tons, Bexar County, Tex., bridge, to Alamo Iron Works, San Antonio, Tex., and Austin Brothers, Dallas, Tex.

CENTRAL STATES

1880 Tons, Youngstown, Ohio, Cedar Street bridge, to Hunter Construction Co., Youngstown.
 1320 Tons, Cleveland, Columbus Road bridge, to Wisconsin Bridge Co., Milwaukee, on bid of \$524,274.
 1280 Tons, Cincinnati, Sixth Street viaduct, to Fort Pitt Bridge Works Co., Pittsburgh.
 1600 Tons, Cleveland, Central High School, to Pittsburgh Bridge & Iron Co., Pittsburgh, through Schirmer-Peterson Co., Cleveland.
 800 Tons, Chicago, northwest side armory, to Bethlehem Steel Co., Bethlehem, Pa.
 540 Tons, Cordova, Iowa, highway bridge, to Pittsburgh-Des Moines Steel Co., Des Moines.
 510 Tons, Indianapolis, Indiana Farm Bureau fertilizer building, to Pittsburgh Bridge & Iron Co., Pittsburgh.
 360 Tons, Minneapolis, Rock Island Lines warm house, to Minneapolis-Moline Power Implement Co., Minneapolis.
 290 Tons, Decatur, Ill., A. W. S. Sealey Mfg. Co. building, to Mississippi Valley Structural Steel Co., St. Louis.
 235 Tons, Cincinnati, Farm Bureau Cooperative Association fertilizer building to Pittsburgh Bridge & Iron Co., Pittsburgh.
 210 Tons, Columbus, Ohio, Champion Avenue housing project, to C. E. Morris Co., Columbus.
 210 Tons, Minneapolis, bridges for Milwaukee Road, to American Bridge Co., Pittsburgh.
 185 Tons, Evansville, Ind., Sunbeam Enamel building, to International Steel & Iron Co., Evansville.
 170 Tons, Chicago, garage, for Chicago Tribune Co., to Wendnagel & Co., Chicago.
 160 Tons, Cincinnati, bulk plant for Standard Oil Co., to Truseon Steel Co., Youngstown.

155 Tons, Maumee, Ohio, Farm Bureau Cooperative Association fertilizer building, to Pittsburgh Bridge & Iron Co., Pittsburgh.

110 Tons, Toledo, Ohio, foundry and warehouse, Doehler Die Casting Co., to Art Iron & Wire Works, Toledo.

WESTERN STATES

400 Tons, San Francisco, plant for Federated Metal Division American Smelting and Refining Co., to Moore Dry Dock Co., Oakland, Cal. (previously reported erroneously to Columbia Steel Co.).
 280 Tons, San Francisco, Coast Guard air station, to Herrick Iron Works, Oakland, Cal.
 151 Tons, San Francisco, Outer Mission Junior High School, to Judson Pacific Co., San Francisco.

PENDING STRUCTURAL PROJECTS

NORTH ATLANTIC STATES

1260 Tons, Philadelphia, Tasker housing project, George A. Fuller, Philadelphia, low on base bid (previously reported).
 1000 Tons, Brooklyn, Shore Parkway bridge MS-39-3.
 800 Tons, Pike County, Pa., highway project, F. D. Kestler, Northumberland, Pa., low bidder (previously reported).
 700 Tons, Fulton, N. Y., factory building for Peter Cailor Kohler Swiss Chocolate Co.
 600 Tons, Pittsburgh, reconstruction, Water Street, contract No. 5.
 600 Tons, Carlisle, Pa., highway bridges, for Pennsylvania Turnpike Commission.
 550 Tons, Green Haven, N. Y., prison cell block.
 450 Tons, Camden, N. J., shipyard ways.
 440 Tons, Cumberland County, Pa., highway bridge, section 19E; being readvertised.
 400 Tons, Franklin Falls, N. H., dam.
 350 Tons, Perth Amboy, N. J., buildings for American Smelting & Refining Co.
 325 Tons, Bloomfield, N. J., school building for St. Thomas Roman Catholic Church.
 225 Tons, Rochester, N. Y., apartment house for W. W. Vicinus.
 225 Tons, Kings Park, N. Y., continued treatment building No. 15.
 200 Tons, Chester, Pa., alterations to power plant.
 160 Tons, Trenton, N. J., Maj. Donnelly Homes, for U. S. Housing Administration.
 160 Tons, New Haven, Conn., New Haven Railroad freight house.
 150 Tons, Harrison, N. J., building for National Oil Products Co.
 150 Tons, Newark, N. J., building for Heinz Co.
 150 Tons, Philadelphia, alterations to Horn & Hardart restaurant.
 100 Tons, Cumberland County, Pa., highway project; bids in.

THE SOUTH

900 Tons, Beaumont, Tex., Nethes River bridge for Texas & New Orleans Railway.
 815 Tons, State of Oklahoma, highway bridges; bids taken July 18.
 350 Tons, State of Oklahoma, highway bridges; bids due Aug. 15.
 225 Tons, Keyser, W. Va., State bridge, North Branch Potomac River.

CENTRAL STATES

1850 Tons, Chicago, section D-1, subway; bids July 27.
 800 Tons, Winnetka, Ill., grade separation project, subway; bids in.
 465 Tons, State of Kansas, two highway bridges, Ottinger Bros., Hinton, Okla., low bidder on general contract.
 250 Tons, Chicago, subway section S-6; new bids asked July 20.
 250 Tons, Avoca, Iowa, railroad bridge No. 4585.
 225 Tons, Highland Park, Mich., dynamometer building for Chrysler Corp.
 200 Tons, Chicago, grain elevator; bids in.
 180 Tons, Rochester, Minn., office building for Mayo Properties Association.

160 Tons, Cleveland, State hospital building, H. F. Juergens, Cleveland, general contractor.
 125 Tons, Chicago, repairs, St. Charles Air Line bridge for Illinois Central System.
 100 Tons, State of Kansas, highway bridge; Maxwell Construction Co., Columbus, Kan., low bidder on general contract.
 100 Tons, Evanston, Ill., store and office building.

WESTERN STATES

420 Tons, Cajon, Cal., railroad bridge A-64.

FABRICATED PLATES AWARDS

355 Tons, South Glens Falls-Canajoharie, N. Y., two tanks for New York Power & Light Corp., to Chicago Bridge & Iron Co., Chicago.

Pending Projects

17,800 Tons, Chicago, subway section D-1; bids July 27. Includes rib beams.
 4700 Tons, Chicago, subway section S-6; new bids asked July 20. Includes rib beams.

SHEET PILING AWARDS

300 Tons, Marblehead, Ohio, dock for Kelly Island Lime & Transport Co., to Bethlehem Steel Co., Bethlehem, Pa.

... PIPE LINES ...

Michigan Consolidated Gas Co., 415 Clifford Street, Detroit, has authorized surveys for new welded steel pipe line from connection with main trunk line near Milan, Mich., to Ann Arbor, Mich., about 21 miles, for natural gas transmission for service at latter place. Local distribution will be carried out by Ann Arbor Division of Consolidated company. It is proposed to have new line ready for operation early in fall.

Department of Public Safety, Municipal Building, Harrisburg, Pa., has awarded contract to Lock Joint Pipe Co., Ampere, N. J. at \$1,137,657 for new trunk water line from Clarks Valley reservoir to connection with system at Seventh and Division Streets, Harrisburg, contract including 99,770 ft. of 42-in. and 507 ft. of 36-in. steel cylinder-lined reinforced-concrete pipe.

Pascagoula, Miss., plans steel pipe line system for municipal natural gas distribution, including welded steel pipe line to point near Lucedale, Miss., about 35 miles, where connection will be made with source of supply. F. P. Joseph, Glenmora, La., is consulting engineer.

Board of Trustees, Old River Elementary School District, Bakersfield, Cal., has asked bids on 16,368 ft. of 3-in., and 800 ft. of 2-in. high-pressure welded pipe for natural gas system in district; also for 150 ft. of high-pressure service pipe.

Center, Tex., plans pressure pipe line system for municipal natural gas distribution, including welded steel pipe line for connection with main source of supply. Cost about \$50,000. Special election has been called Aug. 1 to approve bonds in that amount for project. Y. W. Rogers, mayor, is in charge.

Panhandle Eastern Pipe Line Co., 101 West Eleventh Street, Kansas City, Mo., plans extensions in welded steel pipe lines in northern Indiana and southern Michigan districts, including vicinity of Detroit, for natural gas transmission from Texas Panhandle area to group of new consumers, with estimated requirements about 50 per cent over present distribution.

Board of Aldermen, Houma, La., William J. Drott, city clerk, asks bids until July 26 for pressure pipe line for natural gas distribution system, including regulator stations, laterals and service lines, meters and regulators, etc. T. Baker Smith is city engineer. Requirements will total about 170,000 ft. of pipe, various sizes. Bond issue of \$250,000 was authorized recently for project.

City Gas Co., 200 Dundas Street, London, Ont., has authorized pipe line extensions and replacements in pressure pipe line system for gas distribution in different parts of city, including larger sized pipe for replacing smaller trunk mains in various districts. Work will be carried out by company forces. Cost reported over \$60,000.

THIS WEEK'S MACHINE TOOL ACTIVITIES . . .

... Sales active in most parts of the country, recovering sharply from slow holiday week . . . International Harvester buys for Chicago tractor plant . . . French buying machines for aircraft engine plant through Ford engineers.

Cincinnati Builders Report Increase in Domestic Sales

CINCINNATI—An upward swing to the machinery demand in the local area during the past week established definitely that the previous week's decline was primarily under the influence of the holiday period. Domestic ordering generally seems to be a trifle better, with the disparity between local demand and export demand about on a 40-60 basis, with the foreign still predominating. By and large on the basis of current demand, manufacturers of planers, boring mills, milling machines and grinders appear to be enjoying a little heavier foreign than domestic demand, while producers of lathes, shapers and drilling machinery generally, appear to be having a trifle better domestic than export business. Currently, orders are for single to two unit quantities and so far as reports have been made, there has been no large orders placed.

Plants are still operating at about 60 per cent of capacity on the average, with a number running close to full. Deliveries are still extended and no definite improvement is expected in the immediate future.

International Harvester Starts Huge Buying Program

CHICAGO—The International Harvester Co., in the midst of tooling for a new model track-type tractor which is to be produced at its tractor works in Chicago, last week spent well over \$500,000 on machine tools. The entire job of milling the main-frame for the new tractor will be accomplished by a line of 18 machines built by the Ingersoll Milling Machine Co., Rockford, Ill. Delivery on these has been guaranteed in 60 days. The Ingersoll order is estimated to involve from \$400,000 to \$500,000. Twenty-three machines, the cost of which is believed to exceed \$100,000, were ordered from the Fellows Gear Shaper Co., Springfield, Vt. In addition to these large orders, the Harvester company purchased a number of miscellaneous machine tools and according to local machinery dealers, has only started on the buying program that will be necessary before actual production can begin. Chicago tool and die makers have already received a number of orders from the Harvester company and expect to see considerably more business over the next month or so.

The Rock Island arsenal has not yet purchased any of the machines reported a few weeks ago on its lists of inquiry.

Demand for small tools will probably be fairly light through the summer months.

Vacations Cut Production But Sales Are Good

CLEVELAND—General sales activity continues good in the machine tool market here but due to vacations, production this month will be off. One of the largest producers shut down July 15 for two weeks but the engineering staff of this company will continue working.

Some current sales are projects which originally came to light months ago and in one instance, three years ago. Most buyers desire immediate shipment, in a few recent instances exerting considerable pressure toward the accomplishment of this.

Press manufacturers report first-half sales through the Middle West about 2½ per cent of the first half last year. Ford Motor Co. has been the outstanding buyer recently, placing some \$750,000 for presses in the last two weeks. One press seller here sold 14 medium and small size machines in one day last week, the orders coming from six companies.

Army and Navy Buys Machinery in New England

BOSTON—Springfield, Mass., armory has placed orders for six bench type flexible shaft grinders, a high speed drilling machine, vertical shaving machines and a milling machine. The Watertown, Mass., arsenal has purchased a cylindrical universal grinder, two-spindle reaming machines and two dual hack saws. For the Charleston Navy Yard, the Navy has placed a 50-ton diesel electric locomotive.

Equipment for French Aircraft Plant Being Bought in Detroit

DETROIT—Plans have been laid for an active buying program in Detroit to equip a huge aircraft engine plant in France. It is understood that the French Government has arranged for the manufacture of an English aircraft engine of large horsepower in France. Engineers and buyers have been loaned by Ford Motor Co. to tool up the plant. Buying apparently will be done in Detroit at the Rouge plant. Already it is understood that approximately \$200,000 has been earmarked for large radial mills. Practically all other types of precision equipment will be on the schedule.

Handy Governor Corp., division of

King-Seeley Corp., is moving from its Detroit plant to the King-Seeley plant at Ann Arbor. The move will be completed by the end of July and after that date the two companies will be occupying a new building which is being completed now.

Sales Pick Up in East Following Slow Holiday Week

NEW YORK—Despite the fact that July is usually a very dull month in this district, sales in the past week, the first full week since the holiday, were very encouraging. If the week's pace can be maintained throughout the month, it is likely that on a unit basis July business will be fully equal to June. The week's purchases were primarily from industrial sources and covered a large variety of forming equipment and large and small machine tools. Inquiries also rebounded after the holidays and at present are matching the rate of buying very closely. Buying for Government plants was at a minimum during the week. Navy lists covering shapers for the San Pedro, Cal., plant and lathes for the Alexandria, Va., yard have not been closed as yet.

Machine Tool Orders 200% Over Year Ago

MACHINE tool orders in June were 200 per cent over those received in June of last year. Last month domestic orders were up slightly, but foreign orders declined. The index figure for the month, as reported by the National Machine Tool Builders' Association, was 211.6, down less than 4 per cent from the May high of 219.8. Total orders reported for the second quarter were 16.6 per cent above those received in the first quarter.

Farm Machinery Plant Shuts Down, Orders Slack

MILWAUKEE—A 60-day shutdown of the Van Brunt Co. plant at Horicon, Wis., has been announced by Fred H. Clausen, president of the company, which manufactures drills and other farm machinery. The shutdown is a result of the poor farm trade because of low farm prices, which is resulting in heavy inventories for the Van Brunt company. About 1000 employees are affected by the temporary shutdown.

Wheelco Instruments Co., Chicago, manufacturer of indicating and control instruments, has appointed Industrial Equipment Co., 732 M & M Building, Houston, Tex., and Frank P. Fischer, 1608 Audubon Street, New Orleans, as dealers in their respective territories.

PLANT EXPANSION AND EQUIPMENT BUYING

◀ NORTH ATLANTIC ▶

Best Foods, Inc., 88 Lexington Avenue, New York, canner and packer, has let general contract to James Mitchell, Inc., 575 West Side Avenue, Jersey City, N. J., for two-story and basement addition to plant at Bayonne, N. J. Cost close to \$100,000 with equipment. Lockwood Greene Engineers, Inc., 30 Rockefeller Plaza, New York, is engineer.

Quartermaster, West Point, N. Y., asks bids until July 24 for welding rods, drills, nuts, screws, taps, grinding wheels, wire solder and other equipment (Circular 1052-2).

Stimmel Winch Co., 37-24 Twenty-second Street, Long Island City, manufacturer of electric hoists, winches, parts, etc., has purchased about 24,000 sq. ft. at 32-36 Thirty-third Street, near Thirty-eighth Avenue, and will use part of property for one-story plant, 75 x 100 ft., for which plans were filed recently. Cost about \$40,000 with equipment. Present works will be removed to new location and capacity increased. William Shary, 22 East Seventeenth Street, New York, is architect.

Semet-Solvay Co., 40 Rector Street, New York, has let contract to Monongahela & Ohio Dredging Co., Oliver Building, Pittsburgh, for new unloading dock at branch plant at Ashland, Ky., including mechanical-handling facilities.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 25 for ball bearings (Schedule 6734), electric wire and cable (Schedule 6707) for Brooklyn and Mare Island Navy yards; 15,170 lb. of steel strapping for packing cases (Schedule 6735) for Brooklyn and Norfolk yards; galvanized wire rope clips (Schedule 6686) for Brooklyn, Philadelphia, San Diego and Mare Island yards; 74,000 lb. of boiler compound (Schedule 6712) for Brooklyn and Western yards.

Commanding Officer, Watervliet Arsenal, Watervliet, N. Y., asks bids until July 25 for one engine lathe (Circular 292); until Aug. 1, two vertical shapers (Circular 303).

Curtiss-Wright Corp., Propeller Division, 64 Lakeview Avenue, Clifton, N. J., aircraft propellers, has let general contract to Mahoney-Trost Construction Co., 657 Main Avenue, Passaic, N. J., for two one-story additions, 275 x 502 ft., and 90 x 100 ft., respectively. Cost over \$175,000 with equipment. J. F. Gunther is company engineer.

Board of Education of Lower Camden County, Regional High School District No. 1, Camden, N. J., asks bids until July 26 for manual training, laboratory and other equipment for new high school on White Horse Pike, Lindenwold, N. J.

Allied Metal Stamping Co., Inc., 1475 South Sixth Street, Camden, N. J., stamped metal products, has let general contract to Philip Grabowski, 1208 Chase Street, for one-story addition, 30 x 100 ft., for storage and distribution.

Commanding Officer, Ordnance Department, Picatinny Arsenal, near Dover, N. J., asks bids until July 27 for one automatic cut-off saw, motor-driven, motor to be of explosion-proof type, and one nailing machine with motor enclosed (Circular 1005), one blocking powder vertical type press (Circular 1006), two motor-driven nailing machines, motor of explosion-proof type (Circular 1007), one shock splicer, portable pipe-threading machine, wood shaper and one self-feed gang rip saw, all motor-driven (Circular 1008), continuous melt unit (Circular 19); until July 28, metal parts assemblies for 2000, 1000, 600, 300 and 100-lb. demolition bombs (Circular 1019).

French-Wolf Paint Products Corp., 1700 Walnut Street, Philadelphia, paints, oils, varnishes, etc., has purchased property at Shunk and Swanson Streets, comprising one and two-

story structures, about 40,000 sq. ft. of floor space, and will improve for new plant. Present works, including plant at Bristol, Pa., will be removed to new location where production will be concentrated and increased.

Lincoln Fibre & Specialty Co., Newport, Del., manufacturer of fiber products, plans rebuilding part of mill recently destroyed by fire. Loss about \$50,000 with equipment.

Commanding Officer, Ordnance Department, Frankford Arsenal, Philadelphia, asks bids until July 25 for four oil tanks, each 65-gal. capacity (Circular 18), 75,000 forgings for army bodies (Circular 13), radial ball bearings (Circular 4), automatic indexing dial-type, multiple spindle tapping machine (Circular 8), automatic indexing dial-type, multiple spindle drilling machine (Circular 9); until July 26, automatic indexing dial-type, multiple spindle drilling and tapping machine, all motor driven (Circular 11), thread gages (Circular 15); until July 27, one pull drawer-type core baking oven (Circular 14).

◀ BUFFALO DISTRICT ▶

Hardinge Brothers, Inc., 1418 College Avenue, Elmira, N. Y., precision bench lathes and parts, screw machine products, etc., has approved plans for one-story addition, 60 x 175 ft. Structural steel award has been let to American Bridge Co., Elmira Heights. Cost over \$50,000 with equipment.

Lucidol Corp., 293 Larkin Street, Buffalo, chemical and allied products, is negotiating for acquisition of former plant of Jewett Stove & Foundry Corp., Military Road, consisting of several one and multi-story units, and will remodel for main plant. Cost about \$100,000 with machinery.

General Mills, Inc., Chamber of Commerce Building, Minneapolis, Minn., has let general contract to Charles H. Wing Co., Inc., 75 Vandalia Street, Buffalo, for new nine-story branch plant, 76 x 316 ft., on Michigan Avenue, Buffalo, for cereal products manufacture, flour, etc. Cost about \$1,800,000 with machinery. McEnany & Kraft, Rand Tower, Minneapolis, are architects.

◀ WASHINGTON DIST. ▶

Chemical Warfare Service, Edgewood Arsenal, Edgewood, Md., asks bids until July 25 for one horizontal watertube-type after-cooler, 75 sq. ft. capacity (Circular 8).

Bureau of Yards and Docks, Navy Department, Washington, has low bid from James Stewart & Co., 230 Park Avenue, New York, at \$537,000 for superstructure for one-story addition to gun assembling shop at local navy yard. Equipment will be purchased under separate contracts.

National Distillers Products Corp., Russell and Alluvion Streets, Baltimore, has approved plans for two-story and basement addition, 70 x 75 ft. Cost close to \$40,000 with equipment. William C. Clark, 3203 Juneau Place, is architect.

General Purchasing Officer, Panama Canal, Washington, asks bids until July 24 for 29,700 ft. of traction steel wire rope, 23,150 galvanized wire rope clips, 660 galvanized rigging turnbuckles (Schedule 3512); until July 25, 290,000 ft. of rubber-insulated copper wire, 112,500 ft. of rigid steel conduit, 15,000 ft. of copper telephone wire, 20,500 conduit bushings, 500 conduit bushing nipples, 124 conduit elbows, 20,500 conduit locknuts (Schedule 3514); until July 26, five second-hand steam locomotives (Schedule 3511).

Tri-State Development Corp., Southern Building, Washington, Louis Fisher, president, has acquired an industrial building at Bowditch, N. C., and will remodel for new feldspar

grinding and milling plant. Cost close to \$50,000 with equipment.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 25 for copper-nickel alloy tubing (Schedule 6742) for Portsmouth and Mare Island yards; 62,000 sq. ft. of galvanized steel netting (Schedule 6721) for Sewalls Point and Mare Island yards; wire cloth (Schedule 6738), about 20,000 galvanized iron buckets (Schedule 6700), electric cable (Schedule 6731), about 60,000 lb. of steel wool (Schedule 6722), chain (Schedule 6739) for Eastern and Western yards; until July 28, brakes for airplanes (Schedule 900-2681) for Anacostia, D. C., Pensacola, Fla., and San Diego, Cal., yards.

◀ NEW ENGLAND ▶

Bethlehem Shipbuilding Corp., Quincy, Mass., plans one-story addition for storage and distribution. Cost over \$125,000 with mechanical-handling and other equipment.

Commanding Officer, Ordnance Department, Springfield Armory, Springfield, Mass., asks bids until July 24 for 10,000 operating rod springs (Circular 4); until July 25, 10,000 cartridge ejector springs, 10,000 hammer springs, 10,000 extractor springs, 10,000 rear sight nut lock springs, and 6000 clip latch springs (Circular 8).

Old Eastern Coal Co., Providence, R. I., plans rebuilding coal storage and distributing plant on waterfront, recently destroyed by fire. Loss estimated at \$100,000 with coal-handling and loading machinery. Narragansett Electric Lighting Co., secures coal for power station from this source and is financially interested in plant.

Coca-Cola Bottling Co., Inc., 68 Woodbridge Street, New London, Conn., has let general contract to J. W. Bishop Co., 109 Foster Street, for new one and two-story mechanical-bottling plant, 62 x 105 ft., on Bank Street. Cost about \$50,000 with equipment. Jesse M. Shelton, Bona Allen Building, Atlanta, Ga., is architect.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 28 for motor-driven pumps, spare parts, tools and wrenches (Schedule 6756) for Boston, Charleston and Puget Sound Navy yards.

◀ SOUTH ATLANTIC ▶

Standard Oil Co., 746 Marietta Street, N. W., Atlanta, Ga., has asked bids on general contract for new bulk oil storage and distributing plant at Dallas, Ga., including pumping station, and steel tank storage units. Cost close to \$50,000 with equipment.

Orangeburg-Aiken Hydro-Electric Commission, Orangeburg, S. C., plans hydroelectric generating plant on Edisto River, near junction with Cattle Creek, consisting of power dam 50 ft. high and 16,500 ft. long, with power plant of 12,069-hp. capacity, and transmission lines to Orangeburg, Graniteville, S. C., and other points, about 100 miles, with power substations and switching stations. A steam-electric power plant will be built at Graniteville. Entire project will cost over \$1,200,000. D. T. Duncan Engineering Co., Ninety-Six, S. C., is consulting engineer.

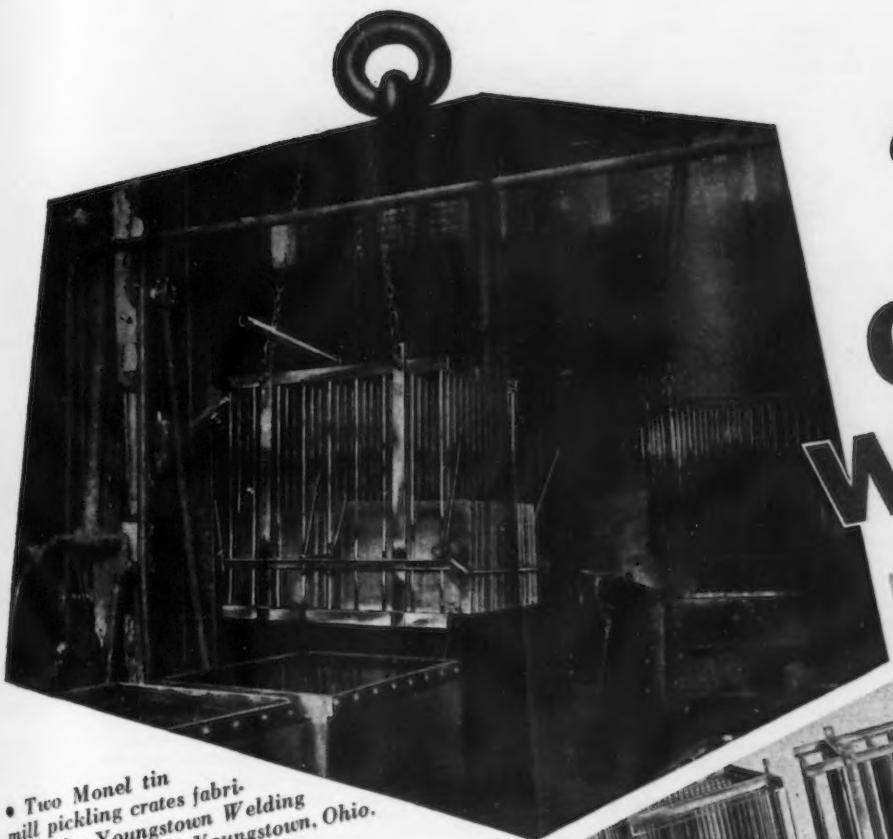
◀ SOUTHWEST ▶

Cook Paint & Varnish Co., 1412 Knox Street, North Kansas City, Mo., has awarded general contract to Winn-Senter Construction Co., 1300 East Seventy-fifth Street, Kansas City, Mo., for one-story addition, 100 x 118 ft. Cost close to \$40,000 with equipment. Erwin Pfuhl, Finance Building, is engineer.

Jones Electric Machine Co., Topeka, Kan. E. A. Jones, head, plans new one-story and basement plant at Decatur and North Santa Fe Streets, Salina, Kan., for production of special electric machinery and parts. Cost about \$40,000 with equipment.

Consumers Glue Co., 24 South Commercial Street, St. Louis, has acquired one-story building at 3320 South Broadway for expansion.

Ben Franklin Refining Co., Tulsa, Okla., affiliated with Bell Oil & Gas Co., same ad-



• Two Monel tin mill pickling crates fabricated by Youngstown Welding & Engineering Co., Youngstown, Ohio.

build up on LOAD WEIGHT

• Use Monel and you can design crates to carry more than twice what a cast crate of the same weight will hold. In fact, right now you can go into Pickle Houses and see Monel* crates handling no less than 27 times their own weight in pay load.

And the reasons: Monel is stronger and tougher than structural steel. Also, it's available in standard forms and sizes which are easily fabricated and welded. So you can get clean, smooth, welded construction and use light weight design. Still more important: Sulphuric, hydrochloric, hydrofluoric acids have little effect on Monel. Monel Pickling Crates have seen as much as nineteen years' service. And in addition to resistance to corrosion Monel has a degree of ductility and toughness which enables it to take hard knocks aplenty. Where the average crate is often shot after a few years' service, the crate of Monel



• Monel tin mill pickling crates also fabricated by Youngstown Welding & Engineering Co. Each crate was designed to carry a load of 3500 lbs.

is strong and serviceable. So in designing Pickling Crates of Monel you do not need to make them oversize to allow for weakening due to corrosion.

Using Monel you can design a smaller, lighter crate that'll carry a bigger pay load. And that means more pickled parts with less power, less acid, less labor—less expense all the way through. For these reasons it would pay you to get the dope on design and construction of Monel Pickling Crates. Write for your copy of "Equipment Designs for the Pickle House" and "A Good Start to a Better Finish."

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street
New York, N. Y.

MONEL



* MONEL is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. This alloy is mined, smelted, refined, rolled and marketed solely by International Nickel.

dress, has let contract to Dresser Engineering Co., Philtower Building, Tulsa, for two-cycle cracking tower unit and ethyl gasoline blending apparatus refinery at Ardmore, Okla., where expansion and improvements will be made. Entire project will cost over \$75,000 with machinery.

Vernors Ginger Ale Co., 4906 Harrisburg Avenue, Houston, Tex., plans new mechanical-bottling works at rear of present plant, consisting of large one-story structure, with storage and distributing facilities, work to begin in fall. Cost over \$125,000 with equipment. Company also plans factory branches, storage and distributing plants at Dallas, Fort Worth and Austin, Tex.

City Council, Weatherford, Tex., has plans for new municipal electric light and power plant. Cost about \$250,000 with equipment. Bond issue has been voted in that amount. Albert C. Moore & Co., Smith-Young Tower Building, San Antonio, are consulting engineers.

◀ SOUTH CENTRAL ▶

B. F. Goodrich Co., Akron, Ohio, automobile tires, tubes, etc., has awarded general contract to Batson-Cook Co., West Point, Ga., for new mill at Clarksville, Tenn., consisting of main one-story unit, 200 x 800 ft., with power house, machine shop, service and garage building and other structures. Plant will be used exclusively for manufacture of mechanical rubber goods. Cost close to \$1,500,000 with equipment.

Standard Oil Co., Memphis, Tenn., plans addition to bulk oil plant at foot of Wisconsin Street, including new steel tank units of 75,000-bbl. additional capacity and other facilities. Cost close to \$60,000.

United States Engineer Office, Vicksburg, Miss., asks bids until July 24 for 3500 lin. ft. of 1-in. plow steel wire rope (Circular 3), one cast steel master gear, one cast steel intermediate gear, two intermediate shafts (forged chrome molybdenum steel), one port hauling drum pinion, one forged steel spud drum pinion, and one pattern and core boxes for master gear (Circular 5); until July 27, about 300,000 lb. of steel wire strand (Circular 2).

Union Oil Co., Maysville, Ky., plans new bulk oil storage and distributing plant, including pumping station, steel storage tanks and other facilities. Cost about \$45,000.

◀ OHIO AND INDIANA ▶

Humphreys Mfg. Co., Mansfield, Ohio, manufacturer of pumping machinery and parts, plumbing equipment, etc., has let general contract to Jacob Wolf Construction Co., Mansfield, for three-story and basement addition for storage and distribution. Cost about \$85,000 with equipment. C. W. Conklin, Mansfield, is architect.

Willys-Overland Motors, Inc., Wolcott Boulevard, Toledo, Ohio, is planning expenditure of close to \$1,000,000 for tools, dies and equipment for production of new 1940 model automobiles. Company has arranged for RFC loan of \$2,500,000, from which appropriation noted will be secured, and an additional fund used for certain plant expansion.

Lederer Iron & Steel Co., 9103 Frederick Avenue, Cleveland, plans one-story building at 9515 Woodland Avenue, S. E., for storage and distribution. Cost close to \$40,000 with equipment. H. F. Jeffery, 4290 East 136th Street, is architect.

Champion Paper & Fibre Co., Inc., Hamilton, Ohio, plans one and multi-story units for expansion at branch sulphate pulp and paper mill at Pasadena, near Houston, Tex., operated as Houston Division. Cost about \$3,000,000 with machinery. Financing will be arranged through preferred stock issue.

Contracting Officer, Material Division, Air Corps, Wright Field, Dayton, Ohio, asks bids until July 24 for drift-type meter assemblies (Circular 3).

Indiana Farm Bureau Co-operative Association, Inc., 309 West Washington Street, Indianapolis, has asked bids on general contract for one-story commercial fertilizer plant

on 16-acre tract at Belmont Avenue and State Road 67, with power house, machine shop, storage and distributing buildings, and miscellaneous structures. Cost about \$150,000 with equipment. M. K. Derrick is assistant manager of fertilizer department.

◀ WESTERN PA. DIST. ▶

Pittsburgh Plate Glass Co., Grant Building, Pittsburgh, has authorized expansion and improvements in sheet glass plant at Ford City, Pa., including replacement of section of present pot furnaces with new continuous tank and lehr, modernization and extensions in batch-handling equipment and other machinery. Entire project will cost close to \$1,700,000.

Board of Clearfield County Commissioners, Clearfield, Pa., will take bids soon for new power house at local county home, including installation of two boiler units, stokers and auxiliary equipment. Russell G. Howard, Deposit National Bank Building, DuBois, Pa., is architect.

City Controller, City-County Building, Pittsburgh, asks bids until July 25 for requirements of parts during remainder of 1939 for Austin sweepers and Diamond "T" trucks for departments of city and city-owned institutions.

◀ MICHIGAN DISTRICT ▶

Detroit Gasket & Mfg. Co., 12640 Burt Avenue, Detroit, plans new one-story plant at Marine City, Mich., for which bids will be asked soon on general contract. Cost over \$50,000 with equipment. H. D. Ilgenfritz, 468 Prentiss Street, Detroit, is architect.

Ford Motor Co., Dearborn, Mich., has let general contract to Bryant & Detwiler Co., Penobscot Building, Detroit, for one-story addition to River Rouge plant, 300 x 680 ft., for car-delivery building, connecting with three production lines for testing, inspection and other mechanical finishing work. It will replace a smaller unit now in service and is scheduled for completion early in fall. Cost about \$500,000 with equipment.

Chris-Craft Corp., Algonac, Mich., manufacturer of utility boats, cruisers and other vessels, has taken title to 30-acre tract of waterfront property at Holland, Mich., and will complete plans soon for initial units of new works for construction of standardized boats of different types, with repair, storage and distribution facilities. Cost over \$70,000 with equipment. Part of present operations will be transferred from Algonac, with company maintaining headquarters at latter place, as heretofore.

◀ MIDDLE WEST ▶

Montgomery Ward & Co., West Chicago Avenue and North Larabee Street, Chicago, mail order merchandiser, has let general contract to B-W Construction Co., 307 North Michigan Avenue, for one and multi-story plant at Tenth and Washington Streets, for production of paints, oils, etc. Cost over \$200,000 with equipment. R. R. Rowe is company architect.

Jo-Carroll Electric Cooperative, Inc., Elizabeth, Ill., M. S. Rogers, president, plans electric power plant for power supply for rural electric system. Cost about \$75,000 with equipment. Financing has been arranged through Federal aid. Work is scheduled to begin soon.

Bureau of Reclamation, Denver, asks bids until Aug. 1 for a ditch-cleaning and excavating machine of crawler-traction and endless-chain, bucket-digging unit type for use on drains and canals, Riverton project, Riverton, Wyo. (Specifications 1258-D); until July 24 for copper cable and copper tubing (Specifications A-46301-A).

City Council, Montezuma, Iowa, asks bids until Aug. 2 for municipal electric power plant, including two diesel engine-generating units, 650 to 850 bhp., and auxiliary equipment. Cost about \$135,000. A. S. Harrington, Baum Building, Omaha, Neb., is consulting engineer.

Northern Pacific Railway Co., Railroad Building, St. Paul, Minn., has asked bids on general contract for one-story addition to engine house at shops at Laurel, Mont. Cost close to \$40,000 with equipment.

Rhinelander Paper Co., Rhinelander, Wis., glazed, glassine and other processed paper stocks, has begun construction of two-story addition, 48 x 95 ft., for which general contract recently was let to C. R. Meyer & Sons Co. Cost close to \$40,000 with equipment.

City Council, Preston, Iowa, asks bids until Aug. 1 for extensions and improvements in municipal electric power plant, including three 75-kw. generating units, with alternate bids on two 120-kw. generators, cooling system, regulating equipment, etc. Ralph W. Gearhart, 349 Twenty-first Street, S. E., Cedar Rapids, Iowa, is consulting engineer.

◀ PACIFIC COAST ▶

Department of Water and Power, 207 South Broadway, Los Angeles, will take bids soon on general contract for one-story equipment shop, storage and distributing building, with pumping station, service and garage unit for motor trucks and cars, and machine shop at Boulder City, Nev., for use in connection with municipal power supply from Boulder dam hydroelectric generating plant. Cost over \$80,000 with equipment.

Axelson Mfg. Co., 6160 South Boyle Street, Los Angeles, oil well-pumping machinery, parts, etc., plans one-story branch plant at Houston, Tex., for parts production and assembling. Cost over \$200,000 with equipment. Work is scheduled to begin soon.

Pacific Gas Radiator Co., 7615 Roseberry Avenue, Huntington Park, Cal., gas heating radiators, parts, etc., has asked bids on general contract for one-story addition, about 18,000 sq. ft. floor space. Cost over \$60,000 with equipment. W. M. Bostock, 6221 Pacific Boulevard, is engineer.

Italian Wineries of Washington, Inc., 1101 Twenty-third Avenue, Seattle, has purchased a two-story building, 45 x 90 ft., at Airport Way and Adams Street, with adjoining site, and will remodel for new winery.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until July 25 for heat and flame-resistant electric cable (Schedule 7640) for Mare Island, Navy Yard; one motor-driven standard pattern shaper (Schedule 6732) for San Pedro, Los Angeles, station.

Board of Regents, University of Arizona, Tucson, Ariz., has authorized plans for one-story addition for College of Mines. Cost about \$250,000 with machinery and technical testing equipment. A fund in that amount has been secured.

Crown Willamette Paper Co., Camas, Wash., kraft, book and other paper stocks, has awarded general contract to Drake, Wyman & Voss, Fenton Building, Portland, for four-story addition, 42 x 224 ft., and one-story extension, 44 x 120 ft., for expansion in bag-making and other departments, including storage and distribution. Cost over \$100,000 with equipment.

◀ FOREIGN ▶

Moulded Products (Australasia), Ltd., Melbourne, Victoria, Australia, plastic products, plans new one-story plant, for large increase in present capacity. Company has disposed of a stock issue of about \$200,000, a considerable portion of proceeds to be used for project.

Manitoba Sugar Co., Ltd., Winnipeg, Man., has let general contract to Carter-Halls-Aldingen Co., Ltd., Winnipeg, for new beet sugar mill near city, comprising several one and multi-story units for main refining plant, machine shop, packing, storage and distribution; a power house will be built. Cost about \$1,750,000 with equipment.

Canadian Associated Aircraft, Ltd., 1050 Beaver Hall Hill, Montreal, Que., airplanes and parts, has let contract to Standard Steel Construction Co., Ltd., Welland, Ont., for new one-story plant, 260 x 270 ft., at Malton, Ont., primarily for assembling works. Cost over \$175,000 with equipment.

PRODUCTS INDEX

BLANKS—Gear and Pinion
Chicago (Ill.) Rawhide Mfg. Co., The,
1308 Elston Ave.

BLANKS—Gear, Silent Steel
Waldron, John, Corp., New Brunswick,
N. J.

BLAST CLEANING EQUIPMENT
American Foundry Equipment Co., The,
510 S. Byrkit St., Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.

BLAST FURNACES
Brassert, H. A. & Co., Chicago, Ill.
Demar Corp., Duisburg, Germany

BLAST GATES
Rockwell, W. S., Co., 50 Church St., N. Y. C.

BLOCKS—Chain
Yale & Towne Mfg. Co., The, Phila. Div.,
Phila., Pa.

BLOWERS
Buffalo (N. Y.) Forge Co., 492 Broadway.

BLOWPIPES—Oxy-Acetylene Welding &
Cutting
Linde Air Products Company, The, 30 East
42nd St., N. Y. C.

BOILERS—Waste Heat
Babcock & Wilcox Co., The, 85 Liberty
St., N. Y. C.

BOILERS—Water Tube
Babcock & Wilcox Co., The, 85 Liberty
St., N. Y. C.

BOLT CUTTERS
Landis Mch. Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.

BOLT AND NUT MACHINERY
Acme Machinery Co., The, Cleveland.
Ajax Mfg. Co., The, Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio.
Waterbury (Ct.) Farrel Fdry. & Mch.
Co., The.

BOLT POINTING MACHINES
Acme Machinery Co., The, Cleveland.

BOLT & RIVET CLIPPERS
Bielwig Mfg. Co., St. Paul, Minn.

BOLTS—Carriage and Machine

Cleveland (Ohio) Cap Screw Co., The.
Lamson & Sessions Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut
Co., Port Chester, N. Y.
Triplex Screw Co., Cleveland.

BOLTS—Special
Lamson & Sessions Co., The, Cleveland.
Russell, Burdsall & Ward Bolt & Nut
Co., Port Chester, N. Y.

BOLTS—Special, Hot or Cold Upset

Lamson & Sessions Co., The, Cleveland.

BOLTS—Steel
Lamson & Sessions Co., The, Cleveland.
Progressive Mfg. Co., Torrington, Conn.

BOLTS—Steel, Recessed Head

American Screw Co., Providence, R. I.

BOLTS—Track
Carnegie-Illinois Steel Corp. (U. S. Steel
Corp. Subsidiary), Pittsburgh & Chi-
cago.

BOLTS AND NUTS

American Screw Co., Providence, R. I.
Clark Bros. Bolt Co., Milldale, Conn.

Lamson & Sessions Co., The, Cleveland.
Republic Steel Corp., Cleveland, Ohio.
Russell, Burdsall & Ward Bolt & Nut
Co., Port Chester, N. Y.

Triplex Screw Co., Cleveland.

BOLTS AND NUTS—Self Locking

Lamson & Sessions Co., The, Cleveland.

BOND—Grinding Wheel

Bakelite Corp., 247 Park Ave., New York
City.

BORING BARS

Billard Co., The, Bridgeport, Conn.

BORING, DRILLING & MILLING MA-

CHINES—Horizontal

Hill-Clarke Mchry. Co., 647 W. Wash-
ington Blvd., Chicago.

Lucas Machine Tool Co., Cleveland.

National Automatic Tool Co., Richmond,
Ind.

Universal Boring Mch. Co., Hudson, Mass.

BORING & DRILLING MACHINES—
Vertical

Baker Bros., Inc., Toledo, Ohio.

Billard Co., The, Bridgeport, Conn.

BORING MACHINES—Diamond & Car-
bide Tools

Field Machine Co., Worcester, Mass.

BORING MACHINES—Jig

Pratt & Whitney Div., Niles-Bement-Pond
Co., Hartford, Conn.

BORING MACHINES—Presision

Cimatool Co., The, Dayton, Ohio.

BORING & TURNING MILLS—Vertical

Billard Co., The, Bridgeport, Conn.

Cincinnati (Ohio) Planet Co.

BRAKE LINING AND BLOCKS—Asbes-
tos

Manhattan Rubber Mfg. Div. of Ray-
bestos-Manhattan, Inc., The, 2 Town-
send St., Passaic, N. J.

BRAKES—Electric

Cork Controller Co., The, Cleveland.

Cutter-Hammer, Inc., Milwaukee.

Electric Controller & Mfg. Co., The,
Cleveland.

Klekaefner Corp., Cedarburg, Wisc.

Electric Controller Co., The, Cleveland.

Electric Controller & Mfg. Co., The,
Cleveland.

BRAKES—Magnetic

Klekaefner Corp., Cedarburg, Wisc.

Stearns Magnetic Mfg. Co., 635 So. 28th
St., Milwaukee.

BRAKES—Metal Forming
Bryant Machinery & Engineering Co.,
Chicago.

Cincinnati (Ohio) Shaper Co., The,
Cleveland Crane & Engineering Co.,
Steelweld Machinery Div., Wickliffe,
Ohio.

Dreel & Krump Mfg. Co., Chicago.

Ferracut Machine Co., Bridgeport, N. J.

Scatz Mfg. Co., The, Poughkeepsie, N. Y.

BRICK—Fire Clay

Carborundum Co., The, Niagara Falls, N. Y.

Illinois Clay Products Co., Joliet, Ill.

BRICK—Insulating

Babcock & Wilcox Co., The, 85 Liberty
St., N. Y. C.

BRIDGE BUILDERS

American Bridge Co. (U. S. Steel Corp.
Subsidiary), Pittsburgh.

Belmont Iron Works, Philadelphia.

BRIDGE OPERATING MACHINERY—
Movable

Earle Gear & Mch. Co., Philadelphia.

BRICKETS—Ferroalloy

Electro Metallurgical Sales Corp., 30 East
42nd St., N. Y. C.

BRONCHES

Colonial Broach Co., Detroit.

BRROACHING MACHINES

Billard Co., The, Bridgeport, Conn.

Cincinnati (Ohio) Milling Mch. Co., The.

Colonial Broach Co., Detroit.

Lucas Machine Tool Co., Cleveland.

Oilgear Co., The, 1311 W. Bruce St., Mil-
waukee.

BRONZE FOR DIES

Amico Metal, Inc., Milwaukee, Wisc.

BRONZE—Phosphor

Bunting Brass & Bronze Co., Toledo, Ohio.

BRUSHES—Machine

Pittsburgh Plate Glass Co., Brush Div.,
Baltimore, Md.

BRUSHES—Wire

Pittsburgh Plate Glass Co., Brush Div.,
Baltimore, Md.

BUCKETS—Clamshell

Blaw-Knox Div. of Blaw-Knox Co., Pitts-
burgh, Pa.

Cullen-Friedest Co., 1303 S. Kilbourn
Ave., Chicago.

Hayward Co., The, 50 Church St., N. Y. C.

Heyl & Patterson, Inc., Pittsburgh.

Industrial Brownholt Corp., Bay City,
Mich.

Wellman Engineering Co., The, Cleve-
land.

BUCKETS—Electric Motor

Hayward Co., The, 50 Church St., N. Y. C.

BUCKETS—Orange Peel

Hayward Co., The, 50 Church St., N. Y. C.

BUFFERS & POLISHING MACHINES

Packer Machine Co., The, Meriden, Conn.

BUFFING APPLICATORS—Automatic

Packer Machine Co., The, Meriden, Conn.

BUFFING COMPOUND

Harrison & Co., Haverhill, Mass.

BUILDINGS—Steel

American Bridge Co. (U. S. Steel Corp.
Subsidiary), Pittsburgh.

American Rolling Mill Co., Middletown,
Ohio.

Belmont Iron Works, Philadelphia.

Blaw-Knox Div. of Blaw-Knox Co., Pitts-
burgh, Pa.

Iron & Steel Products, Inc., Chicago.

BULLDOZERS

Ajax Mfg. Co., The, Cleveland, Ohio.

Cleveland Crane & Engineering Co.,
The Steelweld Machinery Div., Wickliffe,
Ohio.

BURNISHING MACHINES—Gear

Cimatool Co., The, Dayton, Ohio.

BURNING MACHINES

Acme Machinery Co., The, Cleveland.

Cimatool Co., The, Dayton, Ohio.

BUSHINGS—Bronze

Amico Metal, Inc., Milwaukee, Wisc.

Bunting Brass & Bronze Co., Toledo, Ohio.

Johnson Bronze Co., 505 So. Mill St., New
Castle, Pa.

Shenango-Penn Mold Co., Dover, Ohio.

BUSHINGS—Oilless

Rhodes, R. W., Metaline Co., Inc., Long
Island City, N. Y.

BUSHINGS—Phosphor Bronze

Bunting Brass & Bronze Co., Toledo, Ohio.

BY-PRODUCTS COKE AND GAS

Koppers Co., Engineering & Construction
Div., Pittsburgh.

CABLE—Electric

General Electric Co., Schenectady, N. Y.

Lincoln Electric Co., The, Cleveland.

CABLEWAYS AND TRAMWAYS—See
Tramways

CALCIUM METAL & ALLOYS

Electro Metallurgical Sales Corp., 30 East
42nd St., N. Y. C.

CARBIC

Linde Air Products Company, The, 30 East
42nd St., N. Y. C.

CARBIDE

Air Reduction Sales Co., 60 East 42nd
St., N. Y. C.

Linde Air Products Company, The, 30 East
42nd St., N. Y. C.

CARBIDE—Barren

Norton Co., Worcester, Mass.

JUST BETWEEN US TWO

Punishment

The high regard in which this "colorful," "splendid," "wonderful" (culled from the more apathetic of recent testimonials—names on request) journal is held is demonstrated abundantly by the fact that, apart from periods of major depression, four out of five subscribers stay for the next show.

The fifth leaves to keep the actuarial tables honest or because of a change of business, or because none of the quoted adjectives expresses his opinion of your favorite family journal. But occasionally there are other reasons for recalcitrance. For example, one of our field men called the other day on a Michigan firm that failed to renew, and reports:

"Mr. . . . said his partner takes the company copy of The Iron Age home and doesn't bring it back, so to teach him a lesson he is discontinuing until the Fall."

Harmonizer

To prevent fallings-out between partners we furnish neatly printed routing forms, bearing the company name at the top, and below, the names of readers. A supply is yours for the asking. The address is 239 W. 39th St., New York City.

Trans-Atlantic Flight

A forgotten genius originated this idea of supplying reader slips some twenty years ago and we have been using it ever since. To show how quickly ideas jump from continent to continent, it has just been adopted by an English contemporary, which publicizes it in a circular headed, "Firms who subscribe"

We have noticed lately that others, more observant than we are, have detected a change in the gender of the noun "firm," and are boldly coupling it with the personal pronoun. But we'll wait for the X-ray.

Oops! Sorry!

A workman accidentally allowed his tongs to pass through the rolls of a bar mill in 1859. The polish imparted to the flattened tongs was observed by a young foreman . . . and that's how cold-finishing was born, according to the New York World-Telegram.

The rolls, the story says, were not damaged. One of our editors says they certainly would have been. Will Tom Campbell, our Pittsburgh editor, check up with some of the old-timers to set history right?

Bull's-Eye

The steady flow of orders for reprints of the editorials by our editor-in-chief, John H. Van Deventer, swelled to a torrent when the June 29th editorial, "Uncle Sam—Proprietor," appeared.

Whenever you want any extra copies, say the word. No charge for a couple; quantities at cost.

Whoops, There Sat Dassie

Like ourself, Tom Blair of The J. B. Ford Co. worried about "Dassie's" clip-sitting tendencies, discussed here July 6. So he asked C. G. leSueur, Ford's export manager, who was born and raised in South Africa, to translate the passage from the *Isor News*.

It develops that "Dassie" wasn't sitting on a clip at all, but a rock. "Dassie" is a rock-rabbit and a "klipmuis" is a field mouse that lives among the rocks. Now go on with the story:

"I had not been sitting very long when two round eyes leered around the little brown hill, and whoops—there sat Dassie on a rock. He sat so unconcerned and with such complete lack of care on his face that one would think the world was at peace. After being scared into his lair he ventured out again, coming around the precipice. I sat dead still."

Good Heads

Did you ever hear of Shredded Whale? *Carborundum They Go 'Round and 'Round Together! Allis-Chalmers 5 years in industrial "Dust Bowl" Goodrich*

The golden goose got a double play in last week's headlines. The Lucas Machine Tool Company's ad was headed, "The Goose with the Golden Eggs" and Armstrong-Blum titled its page, "Don't kill the goose that laid the Golden Egg!"

Au Revoir

We're off to the shore for our annual two-week bout with sunburn and sinus trouble.

—A. H. D.

PRODUCTS INDEX

CARBURIZING—See Heat Treating

CARLOADERS
Clark Tractor Div., Clark Equipment Co., Battle Creek, Mich.

CARS—**Railway**
Iron & Steel Products, Inc., Chicago.

CARS—**Industrial and Mailing**
Atlas Car & Mfg. Co., The, Cleveland.
Heyl & Patterson, Inc., Pittsburgh.

CASE HARDENING—See Heat Treating

CASTERS
Darnell Corp., Ltd., Long Beach, Calif.

CASTINGS—**Acid or Heat Resisting**
Ampco Metal, Inc., Milwaukee, Wis.
Cramp Brass & Iron Foundries Co., Philadelphia.

Duriron Co., Inc., The, 438 N. Findlay St., Dayton, Ohio.

HOSE
Hoosier Mfg. Co., Detroit, Mich.

Michigan Products Corp., Michigan City, Ind.

Ohio Steel Foundry Co., Lima, Ohio.

CASTINGS—**Alloy Iron**
Cramp Brass & Iron Foundries Co., Philadelphia.

Michigan Products Corp., Michigan City, Ind.

CASTINGS—**Alloy Steel**
Advance Foundry Co., The, Dayton, Ohio
Hartford (Conn.) Electric Steel Corp.
Mackintosh-Hempill Co., Pittsburgh.
Michigan Products Corp., Michigan City, Ind.

National-Erie Corp., Erie, Pa.

CASTINGS—**Aluminum**
Aluminum Co. of America, Pittsburgh.

CASTINGS—**Bronze, Bronze or Aluminum**
Bunting Brass & Bronze Co., The, Toledo, Ohio.

Cadman, A. W., Mfg. Co., Pittsburgh.
Carbon Malleable Casting Co., Inc., Lancaster, Pa.

Cramp Brass & Iron Foundries Co., Philadelphia.

National Bearing Metals Corp., Pittsburgh.
Shenango-Penn Mold Co., Dover, Ohio.
Spencer's, I. S., Sons, Inc., Guilford, Ct.

CASTINGS—**Bronze**
Koppers Co., Bartlett Hayward Div., Baltimore, Md.

CASTINGS—**Corrosion Resisting**
Cramp Brass & Iron Foundries Co., Philadelphia.

Michigan Products Corp., Michigan City, Ind.

Midvale Co., The, Nicetown, Phila., Pa.

Ohio Steel Foundry Co., Lima, Ohio.

CASTINGS—**Die**
Titan Metal Mfg. Co., Bellefonte, Pa.

CASTINGS—**Die, Aluminum**
Aluminum Co. of America, Pittsburgh.

CASTINGS—**Electric Steel**
Continental Roll & Steel Foundry Co., East Chicago, Ind.

Crucible Steel Castings Co., Lansdowne, Pa.

National-Erie Corp., Erie, Pa.

Ohio Steel Foundry Co., Lima, Ohio.

CASTINGS—**Gray Iron**
Advance Foundry Co., The, Dayton, Ohio.
American Engineering Co., Philadelphia.
Cramp Brass & Iron Foundries Co., Philadelphia.

Dodge Mfg. Corp., Mishawaka, Ind.

Farrel-Birmingham Co., Inc., Ansonia, Conn.

Kline Hardware Co., Allentown, Pa.

Koppers Co., Bartlett Hayward Div., Baltimore, Md.

Lewistown (Pa.) Foundry & Machine Co.

Lobdell Car Wheel Co., Hazel Hammer Div., Wilmington, Del.

National Roll & Fly Co., Avonmore, Pa.

North Wales (Pa.) Mach. Co., Inc.

Spencer's, I. S., Sons, Inc., Guilford, Ct.

CASTINGS—**High Test & Alloy Iron**
Cramp Brass & Iron Foundries Co., Philadelphia.

CASTINGS—**Magnesium Alloys**
Dow Chemical Co., The, 921 Jefferson Ave., Midland, Mich.

CASTINGS—**Malleable**
Canton (Ohio) Malleable Iron Co.

Carbon Malleable Casting Co., Inc., Lancaster, Pa.

East City Malleable Co., The, 5100 Lakeside Ave., Cleveland.

Northern Malleable Iron Co., St. Paul, Minn.

Peoria (Ill.) Malleable Castings Co.

CASTINGS—**Manganese, Steel and Alloy**
Pettibone Mulliken Corp., Chicago.

CASTINGS—**Monel & Nickel**
Cramp Brass & Iron Foundries Co., Philadelphia.

CASTINGS—**Semi-Steel**
Cramp Brass & Iron Foundries Co., Philadelphia.

CASTINGS—**Steel**
American Rolling Mill Co., Middletown, Ohio.

Bethlehem (Pa.) Steel Company.

Birdsboro (Pa.) Steel Foundry & Machine Co.

Carnegie-Illinois Steel Corp. (U. S. Steel Corp. Subsidiary), Pittsburgh & Chicago.

Columbia Steel Co. (U. S. Steel Corp. Subsidiary), San Francisco, Calif.

Continental Roll & Steel Foundry Co., East Chicago, Ind.

Crucible Steel Castings Co., Lansdowne, Pa.

Hartford (Conn.) Electric Steel Corp.

Mackintosh-Hempill Co., Pittsburgh.

Mesta Mch. Co., Pittsburgh.

Michigan Products Corp., Michigan City, Ind.

National-Erie Corp., Erie, Pa.

Ohio Steel Foundry Co., Lima, Ohio.

Standard Steel Wks. Co., Phila., Pa.

Steel Founders' Society of America, Cleveland.

Strong Steel Foundry Co., Buffalo, N. Y.

CEMENT—**Acid-Proof**
Nukem Products Corp., 68 Niagara St., Buffalo, N. Y.

CEMENT—**Polishing Wheel**
Harrison & Co., Haverhill, Mass.

CEMENT—**Refractory**
Carborundum Co., The, Perth Amboy, N. J.

Johns-Manville Corp., 22 East 40th St., New York City.

CEMENT—**Rubber**
Goodrich, B. F., Co., The, Akron, Ohio.

CENTERING MACHINES
Sunstrand Machine Tool Co., Rockford, Ill.

CHAINS—**Conveyor & Elevator**
Baldwin-Duckworth Chain Corp., Springfield, Mass.

Heyl & Patterson, Inc., Pittsburgh.

Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

CHAINS—**Power Transmission**
Baldwin-Duckworth Chain Corp., Springfield, Mass.

Link-Belt Co., 319 North Holmes Ave., Indianapolis, Ind.

Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—**Roller**
Baldwin-Duckworth Chain Corp., Springfield, Mass.

Link-Belt Co., 319 North Holmes Ave., Indianapolis, Ind.

Whitney Chain & Mfg. Co., Hartford, Ct.

CHAINS—**Silent**
Link-Belt Co., 319 North Holmes Ave., Indianapolis, Ind.

Whitney Chain & Mfg. Co., Hartford, Ct.

CHAMFERING MACHINES (Gear)
Cimatool Co., The, Dayton, Ohio.

CHANNELS—**See Angles, Beams, Channels and Tees**

CHECKS—**Metal**
Noble & Westbrook Mfg. Co., The, East Hartford, Ct.

CHEMICALS—**Rust Proofing**
Atrone Chemical Co., Cranston, Providence, R. I.

Parker Rust Proof Co., 2186 Milwaukee Ave., Detroit.

CHROMIUM METAL & ALLOYS
Electro Metallurgical Sales Corp., 30 East 42nd St., N. Y. C.

CHUCKING MACHINES—**Automatic**
New Britain-Gridley Machine Div., The New Britain Machine Co., New Britain, Conn.

CHUCKING MACHINES—**Multiple Spindle**
Baird Mch. Co., The, Bridgeport, Conn.

Goss & DeLeeuw Machine Co., New Britain, Conn.

National Arms Co., The, Cleveland.

Potter & Johnson Machine Co., Pawtucket, R. I.

CHUCKS—**Drill**
Cleveland (Ohio) Twist Drill Co., The.

Cummins Chuck Co., Hartford, Conn.

Moore Twist Drill & Mach. Co., New Bedford, Mass.

CHUCKS—**Electric**
Cushman Chuck Co., Hartford, Conn.

CHUCKS—**Lathe**
Cushman Chuck Co., Hartford, Conn.

CHUCKS—**Magnetic**
Brown & Sharpe Mfg. Co., Providence, R. I.

Head, Machine Co., Worcester, Mass.

Taft-Pelzer Mfg. Co., The, Woonsocket, R. I.

CLAMPS FOR FIXTURES
Detroit (Mich.) Stamping Co.

CLEANERS—**Metal**
American Chemical Paint Co., Ambler, Pa.

Detrola Rex Products Co., Detroit, Mich.

Ford, J. B., Sales Co., The, Wyandotte, Mich.

CLEANING COMPOUNDS—**Alkali**
Detrola Rex Products Co., Detroit, Mich.

CLEANING EQUIPMENT—**Metal**
Detrola Rex Products Co., Detroit, Mich.

CLEANING EQUIPMENT (METAL)—**Electro-Chemical**
Bullard Co., The, Bridgeport, Conn.

CLUTCHES—**Magnetic**
Kiekhafer Corp., Cedarburg, Wis.

Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

CLUTCHES—**FriCTION**
Dodge Mfg. Corp., Mishawaka, Ind.

Twin Disc Clutch Co., Racine, Wis.

CLUTCHES—**Magnetic**
Cutler-Hammer, Inc., Milwaukee.

Dings Magnetic Separator Co., 727 Smith St., Milwaukee.

Kiekhafer Corp., Cedarburg, Wis.

Stearns Magnetic Mfg. Co., 635 So. 28th St., Milwaukee.

COAL
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.

Koppers Coal Co., The, Pittsburgh.

Pickards Mather & Co., Cleveland.

Soujuzgoleepark, Kaliavskaja Ullitz 5, Moscow 6, U. S. S. R.

COAL
Michigan Products Corp., Michigan City, Ind.

National-Erie Corp., Erie, Pa.

Ohio Steel Foundry Co., Lima, Ohio.

Standard Steel Wks. Co., Phila., Pa.

Steel Founders' Society of America, Cleveland.

Strong Steel Foundry Co., Buffalo, N. Y.

COAL
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.

Durant Trading Corp., 511 Fifth Ave., N. Y. C.

COILS—**Lead**
National Lead Co., 111 Bdway., N. Y. C.

COILS—**Pipe**
Harrisburg (Pa.) Steel Corp.

COKE—**Metallurgical**
Cleveland-Cliffs Iron Co., The, Cleveland, Ohio.

Pickards Mather & Co., Cleveland.

COKE OVEN MACHINERY
Atlas Car & Mfg. Co., The, Cleveland.

Koppers Co., Engineering & Construction Div., Pittsburgh.

COLD ROLL FORMING MACHINES
McKay Machine Co., The, Youngstown, Ohio.

COLUMBIUM
Electro Metallurgical Sales Corp., 30 E. 42nd St., N. Y. C.

COMBUSTION CONTROLS
Leeds & Northrup Co., 4956 Stanton Ave., Philadelphia.

Morgan Construction Co., Worcester, Mass.

COMPOUNDS—**Drawing**
Gulf Oil Corp., Gulf Refining Co., Pittsburgh.

Penola, Inc., Pittsburgh.

Standard Oil Co. (Indiana), Chicago.

Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

COMPRESSORS—**Air**
Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.

Demag Corp., Duisburg, Germany.

Westinghouse Air Brake Co., Industrial Div., Pittsburgh.

Worthington Pump & Machinery Corp., Harrison, N. J.

COMPRESSORS—**Gas**
Demag Corp., Duisburg, Germany.

Worthington Pump & Machinery Corp., Harrison, N. J.

COMPRESSORS—**Rebuilt** (See Clearing House Section)

CONDENSERS—**Surface & Jet**
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Worthington Pump & Machinery Corp., Harrison, N. J.

CONDUITS—**Flexible Metallic**
Pennsylvania Flexible Metallic Tubing Co., Philadelphia.

CONTACTS—**Electrical**
Mallory, P. R., & Co., Inc., Indianapolis, Ind.

CONTRACTORS' SUPPLIES—**Second Hand** (See Clearing House Section)

CONTROL SYSTEMS—**Temperature**
Leeds & Northrup Co., 4956 Stanton Ave., Philadelphia.

CONTROLLERS—**Crane**
Clark Controller Co., The, Cleveland.

Cutler-Hammer, Inc., Milwaukee.

Electric Controller & Mfg. Co., The, Cleveland.

CONTROLLERS—**Electric**
Clark Controller Co., The, Cleveland.

Cutler-Hammer, Inc., Milwaukee.

Electric Controller & Mfg. Co., The, Cleveland.

CONTROLLERS—**Valve, Electrically Operated**
Cutler-Hammer, Inc., Milwaukee.

Leeds & Northrup Co., 4956 Stanton Ave., Philadelphia.

CONTROLS—**Time Cycle**
Koppers Co., Bartlett Hayward Div., Baltimore, Md.

CONVEYING AND ELEVATING MACHINERY
Parquar, A. B. Co., Ltd., York, Pa.

Heyl & Patterson, Inc., Pittsburgh.

Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

CONVEYOR WORMS
Lee Spring Co., Inc., 30 Main St., Brooklyn, N. Y.

CONVEYORS—**Monorail**
American Monorail Co., The, Cleveland.

Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

Conco Engineering Works, Div. of The H. D. Conkey & Co., Mendota, Ill.

Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.

Euclid Crane & Hoist Co., The, Euclid, O.

Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

Morgan Engineering Co., The, Alliance, O.

Northern Engineering Works, Detroit, Mich.

Robbins & Myers, Inc., Springfield, Ohio.

Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

Shepard Niles Crane & Hoist Corp., Mound Falls, N. Y.

Whiting Corp., Harvey, Ill.

CRANES—**Gantry**
Ding Corp., Duisburg, Germany.

Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

Morgan Engineering Co., The, Alliance, O.

Shenard Niles Crane & Hoist Corp., Montour Falls, N. Y.

Whiting Corp., Harvey, Ill.

CRANES—**Hand Power**
American Monorail Co., The, Cleveland.

Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

Conco Engineering Works, Div. of The H. D. Conkey & Co., Mendota, Ill.

Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.

Euclid Crane & Hoist Co., The, Euclid, O.

Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

Industrial Brownhoist Corp., Bay City, Mich.

Northern Engineering Works, Detroit.

Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

Shepard Niles Crane & Hoist Corp., Montour Falls, N. Y.

Whiting Corp., Harvey, Ill.

CRANES—**Jib**
American Monorail Co., The, Cleveland.

Euclid Crane & Hoist Co., The, Euclid, O.

Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

Whiting Corp., Harvey, Ill.

CRANES—**Locomotive**
American Hoist & Derrick Co., St. Paul, Minn.

Cullen-Frestedt Co., 1303 S. Kilbourn Ave., Chicago.

Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

Industrial Brownhoist Corp., Bay City, Mich.

Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

Ohio Locomotive Crane Co., The, Bucyrus, O.

Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

Whiting Corp., Harvey, Ill.

CRANES—**Portable**
Farnham, A. B. Co., Ltd., York, Pa.

COPING MACHINES
Cleveland (Ohio) Punch & Shear Works Co., The.

Schmitz Mfg. Co., The, Poughkeepsie, N. Y.

CORE OIL
Penola, Inc., Pittsburgh.

Sun Oil Co., Philadelphia.

Tide Water Associated Oil Co., 17 Battery Place, N. Y. C.

CORUNDUM WHEELS—**See Grinding Wheels**

COTTERS AND KEYS—**Spring**
Hindley Mfg. Co., Valley Falls, R. I.

Hubbard, M. D., Spring Co., 745 Central Ave., Pontiac, Mich.

Lamson & Sessions Co., The, Cleveland.

Western Wire Prods. Co., St. Louis, Mo.

COUNTERBORES
Cleveland (Ohio) Twist Drill Co., The.

Gairing Tool Co., Detroit.

Morse Twist Drill & Mch. Co., New Bedford, Mass.

COUNTERS—**Production**
Durant Mfg. Co., Milwaukee.

Veeder-Roof, Inc., Hartford, Ct.

COUNTERS—**Revolution, Recording**
Durant Mfg. Co., Milwaukee.

COUNTING MACHINES
Durant Mfg. Co., Milwaukee.

Veeder-Roof, Inc., Hartford, Conn.

COUPLINGS—**Cut-off Friction**
Foote Bros. Gear & Machine Co., 5301 H. So. Western Blvd., Chicago, Ill.

COUPLINGS—**Flexible**
Crocker-Wheeler Electric Mfg. Co., Amherst, N. J.

Koppers Co., Bartlett Hayward Div., Baltimore, Md.

Waldron, John, Corp., New Brunswick, N. J.

COUPLINGS—**Pipe**
Harrisburg (Pa.) Steel Corp.

National Tube Co. (U. S. Steel Corp. Subsidiary), Pittsburgh.

CRANES—**Crawling Tractor**
American Hoist & Derrick Co., St. Paul, Minn.

Cullen-Frestedt Co., 1303 S. Kilbourn Ave., Chicago.

Demag Corp., Duisburg, Germany.

Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

Industrial Brownhoist Corp., Bay City, Mich.

Ohio Locomotive Crane Co., The, Bucyrus, O.

Shenard Niles Crane & Hoist Corp., 4401 W. National Ave., Milwaukee.

Whiting Corp., Harvey, Ill.

CRANES—**Electric, Industrial, Truck Mounted**
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.

Elwell-Parker Electric Co., The, Cleveland.

CRANES—**Electric Traveling**
Armen, James P., Pittsburgh.

Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

Conco Engineering Works, Div. of The H. D. Conkey & Co., Mendota, Ill.

Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.

Euclid Crane & Hoist Co., The, Euclid, O.

Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

Morgan Engineering Co., The, Alliance, O.

Northern Engineering Works, Detroit, Mich.

Robbins & Myers, Inc., Springfield, Ohio.

Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

Shepard Niles Crane & Hoist Corp., Mound Falls, N. Y.

Whiting Corp., Harvey, Ill.

CRANES—**Gantry**
Ding Corp., Duisburg, Germany.

Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

Morgan Engineering Co., The, Alliance, O.

Shenard Niles Crane & Hoist Corp., Montour Falls, N. Y.

Whiting Corp., Harvey, Ill.

CRANES—**Hand Power**
American Monorail Co., The, Cleveland.

Cleveland Tramrail Div. of The Cleveland Crane & Engng. Co., Wickliffe, Ohio.

Conco Engineering Works, Div. of The H. D. Conkey & Co., Mendota, Ill.

Curtis Pneumatic Machinery Co., 1948 Kienlen Ave., St. Louis, Mo.

Euclid Crane & Hoist Co., The, Euclid, O.

Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

Industrial Brownhoist Corp., Bay City, Mich.

Northern Engineering Works, Detroit.

Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

Shepard Niles Crane & Hoist Corp., Mound Falls, N. Y.

Whiting Corp., Harvey, Ill.

CRANES—**Jib**
American Monorail Co., The, Cleveland.

Euclid Crane & Hoist Co., The, Euclid, O.

Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

Whiting Corp., Harvey, Ill.

CRANES—**Locomotive**
American Hoist & Derrick Co., St. Paul, Minn.

Cullen-Frestedt Co., 1303 S. Kilbourn Ave., Chicago.

Harnischfeger Corp., 4401 W. National Ave., Milwaukee.

Industrial Brownhoist Corp., Bay City, Mich.

Link-Belt Co., 300 West Pershing Road, Chicago, Ill.

Ohio Locomotive Crane Co., The, Bucyrus, O.

Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc., 402 Broadway, Muskegon, Mich.

Whiting Corp., Harvey, Ill.

CRANES—**Portable**
Canton Fdry. & Mch. Co., Cleveland.

CRANES—**Portable Electric**
Baker-Raulang Co., The, 2175 W. 25th St., Cleveland.

Elwell-Parker Electric Co., The, Cleveland.